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Improved Revolving Blade Scroll Sawing Machine.

This invention provides a novel method of rotating the blade of a scroll sawing machine while running, so as to obviate the turning about of the piece to be cut, the saw itself being made to conform to the curvature of the pattern, instead of making the outline conform to the direction of the saw.

The machine is very highly spoken of by those who have seen it in operation. It is simple in its details, and is claimed to be a marked improvement in the construction of this class of machines. On it a pattern can be cut, extending along a piece twenty feet in length, if desired.

The main working parts of the machine are the hand wheel, A, the twin ratchet wheel, B, connected with the treads, C, and the pawls, D, which cause the wheel, A, and the twin ratchet wheel, B, to rotate, either to the right or left, at the will of the operator, by the pressure of the foot on the treads, C, or the hand on the wheel, A. At the end of the shaft, E, there is a bevel gear marked F—not shown—connected with another bevel gear, through which passes an upright prismatic shaft, G (not in view), to which are securely fastened two pulleys, about which the chain gear, H, passes to two pulleys (of the same size of those fastened to the prismatic shaft, G) marked I, to which the saw holders, J, are securely fastened, the saw, K, being strained and held by J

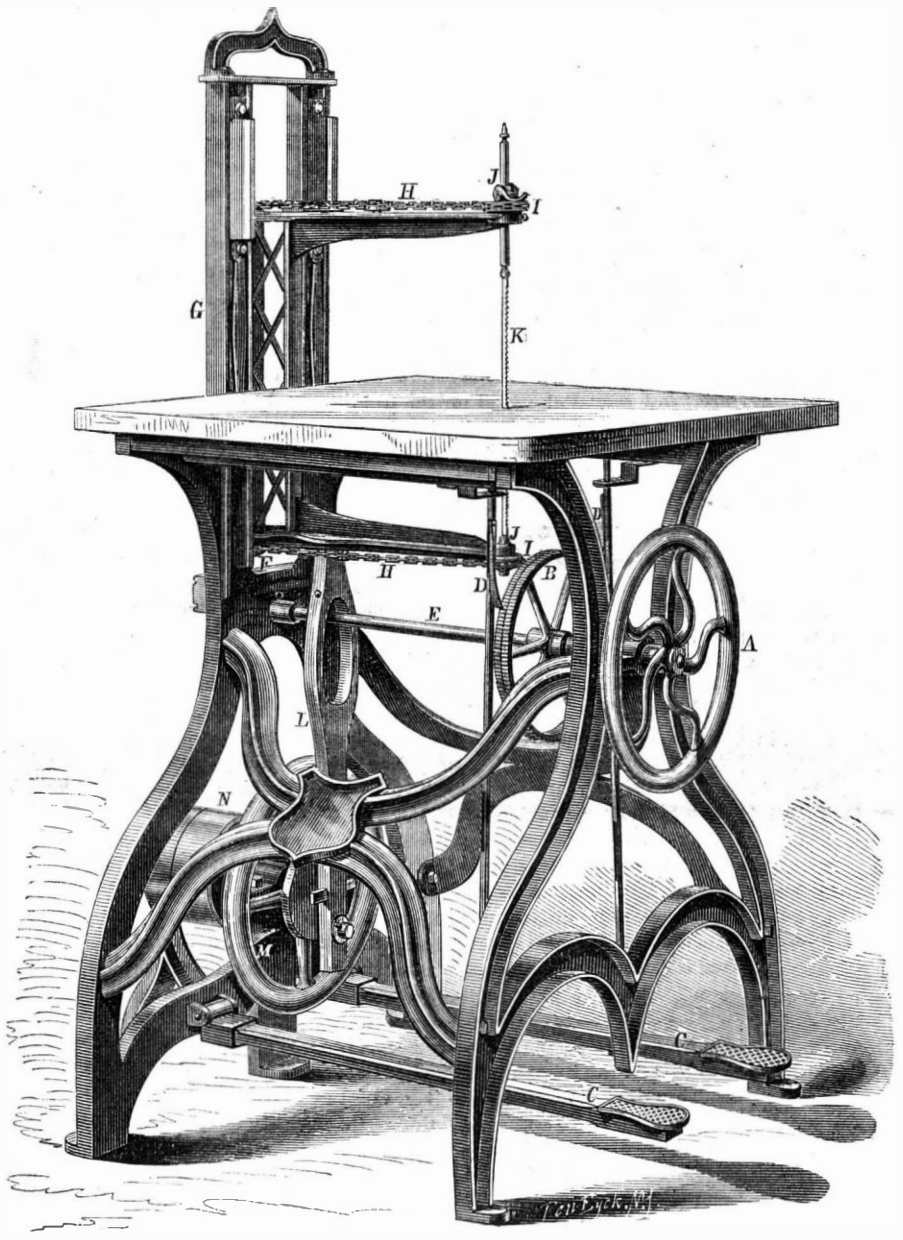
By this arrangement, the saw, K, is caused to rotate either to the right or to the left by the simple pressure of the foot on the treads, C, or by the hand on A, the saw being in motion all the while. The saw is caused to reciprocate by the pitman, L, which is connected to the balance wheel, M, power being applied to the pulley, N.

By this arrangement, boards or planks of any length can be sawn in any shape desired, the saw making all the curves and meanderings, the lumber not rotating at all, as in the usual way in sawing scroll or irregular work.

The machine is said to be small, compact, simple, and durable, working rapidly through thick or thin stuff.

We regard this as an important improvement. With proper proportions in the design of the machine, we see no impracticability in gearing a saw in this manner, and the increased convenience secured by the invention will be apparent to all who have ever run a scroll saw on large work. For architectural purposes, it is specially adapted, and we think it is likely to become popular with those engaged in the manufacture of scroll work.

Patented March 29, 1870. Address, for further information, Charles D. Moore & Co., Lawrence, Mass.



MOORE'S REVOLVING BLADE SCROLL SAWING MACHINE.

Improved Carriage Hub.

Many attempts have been made to construct a hub of small proportions and elegant form, and to so fit the spokes as to combine increased strength with a neater appearance. Ordinarily, so much of the wood is cut away to receive the spokes that the hub is much weakened.

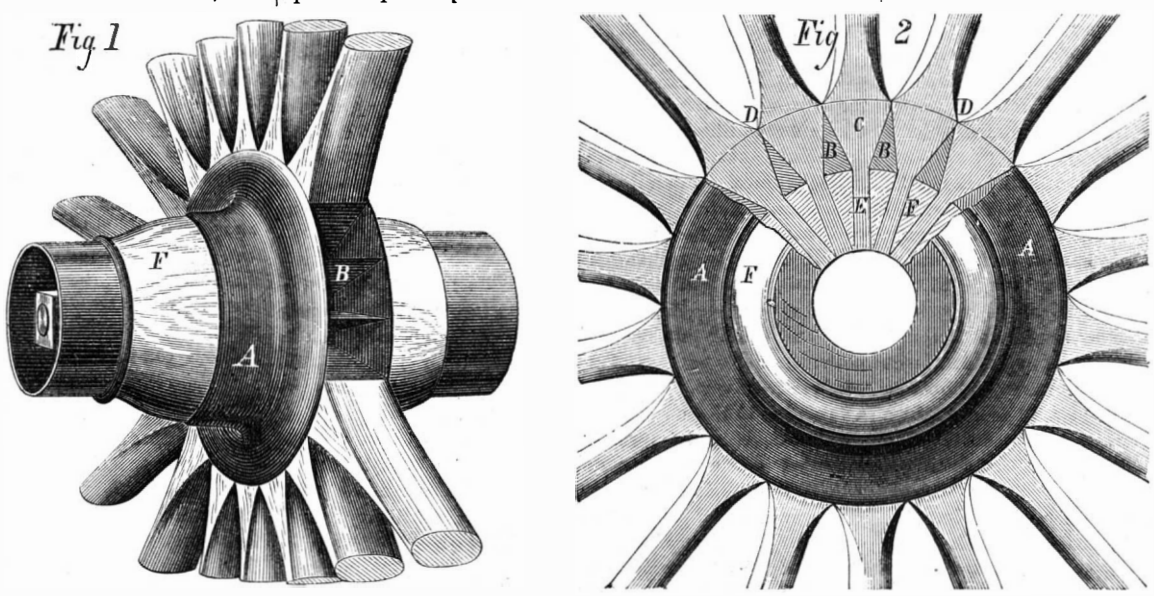
The object of the invention shown in the accompanying engraving is to attain the requisite strength, and at the same time secure a hub of small size and neat appearance.

To accomplish these results, a flanged metallic collar, A, is cast with wedge shaped crossbars or partitions, B, terminating in a sharp edge at the periphery of the collar. Between each two crossbars is formed a wedge shaped socket. In each socket is driven a wedge shaped spoke, or a spoke with wedge shaped enlargements, C, Fig. 2, corresponding exactly in form to the socket, and made to fit it firmly and tightly. The shoulders of the spokes rest against each other at the periphery of the collar, as seen at D, concealing the crossbars, and are thereby rendered selfsustaining and self-tightening.

The spokes have no shoulders at right angles to rest on the wooden hub, F, but are without taper where they enter F, as shown at E. The inclined faces of the spokes rest on the inclined faces of the crossbars, and thereby make the metallic collar bear the pressure and strain of the wheel.

The collar, being solid and spread out over a considerable portion of the wooden hub, the strain and pressure on the latter is more evenly and equally distributed, and not limited, as in other wheels, to the small spaces where the shoulders of the spokes rest on hubs. So entirely do the spokes depend upon the collar and upon the support they give each other, that if all the wood between the mortices were cut away, the wheel would remain nearly as strong as before. By this arrangement, we have a spoke possessing the greatest strength at the point where strength is most needed; and the wooden hub is relieved of the strain where it is necessarily the weakest; while the spokes resting against each other are, as above stated, self-sustaining and self-tightening. The hub is susceptible of being made in any desirable shape, and capable of receiving a neat finish and polish. It is claimed that the tire can be set truer on this wheel than on any other, because it possesses more elasticity at the hub.

Patented May 3, 1870. Rights to manufacture and sell on royalty may be secured by addressing Lowndes H. Davis, Jackson, Mo



O'CONNOR'S IMPROVED CARRIAGE HUB.

Easy Method of Cutting Glass.

The cutting of glass, says the *Technologist*, is an operation so frequently put in practice in the laboratory, that any simple method of effecting it is sure to run the rounds of the press as soon as published. Almost all the methods in common use are very old. Of course, for cutting flat glass, such as window panes, the diamond is the best agent. For cutting rounds, or ovals, out of flat glass, the diamond is the best tool; and, if the operator has no diamond, it will always pay to carry the job to a glazier, rather than waste time and make a poor job by other and inferior means. When, however, it is required to cut off a very little from a circle or oval, the diamond is not available, except in very skillful hands. In this case, a pair of pliers, or very dull scissors, is the best tool, and the cutting is best performed under water. A little practice will enable the operator to shape a small round, or oval, with great rapidity, ease, and precision. When bottles or flasks are to be cut, the diamond is still the best tool in skillful hands; but ordinary operators will succeed best with pastiles, or a red hot poker. We prefer the latter, as being the most easily obtained, and the most efficient; and we have never found any difficulty in cutting off broken flasks so as to make dishes, or to carry a cut spirally round a long bottle, so as to cut it in the form of a corkscrew. And, by the way, when so cut, glass exhibits considerable elasticity, and the spiral may be elongated like a ringlet. The process is very simple. The line of the cut should be marked by chalk, or by pasting a thin strip of paper alongside of it; then make a file mark to commence the cut; apply the hot iron, and a crack will start; and this crack will follow the iron wherever we choose to lead it.

For drilling holes in glass, a common steel drill, well made and tempered, is the best tool. The steel should be worked at a low temperature, so as to be sure not to burn it, and then tempered as hard as possible, in either mercury or a bath of salt water that has been well boiled. Such a drill will go through glass very rapidly, if kept well moistened. A good liquid for moistening such drills is turpentine in which some camphor has been dissolved. This was the lubrica recommended by Griffin in his work on chemical manipulation, and it has been frequently published since. Dilute sulphuric acid is equally good, if not better; and we have found carbolic acid singularly efficient.

It is stated that at Berlin, glass castings for pump barrels, etc., are drilled, planed, and bored, like iron ones, and in the same lathes and machines, by the aid of sulphuric acid.

A little practice with these different plans will enable the operator to cut and work glass as easily as brass or iron.

Recovering Gold.

Gold may be stripped from articles that have been gilt by placing them in strong nitric acid, in which some salt has been previously dissolved. When a number of articles have been stripped in the solution, it begins to work slowly, and it is time then to abandon it, and use a new one. The gold

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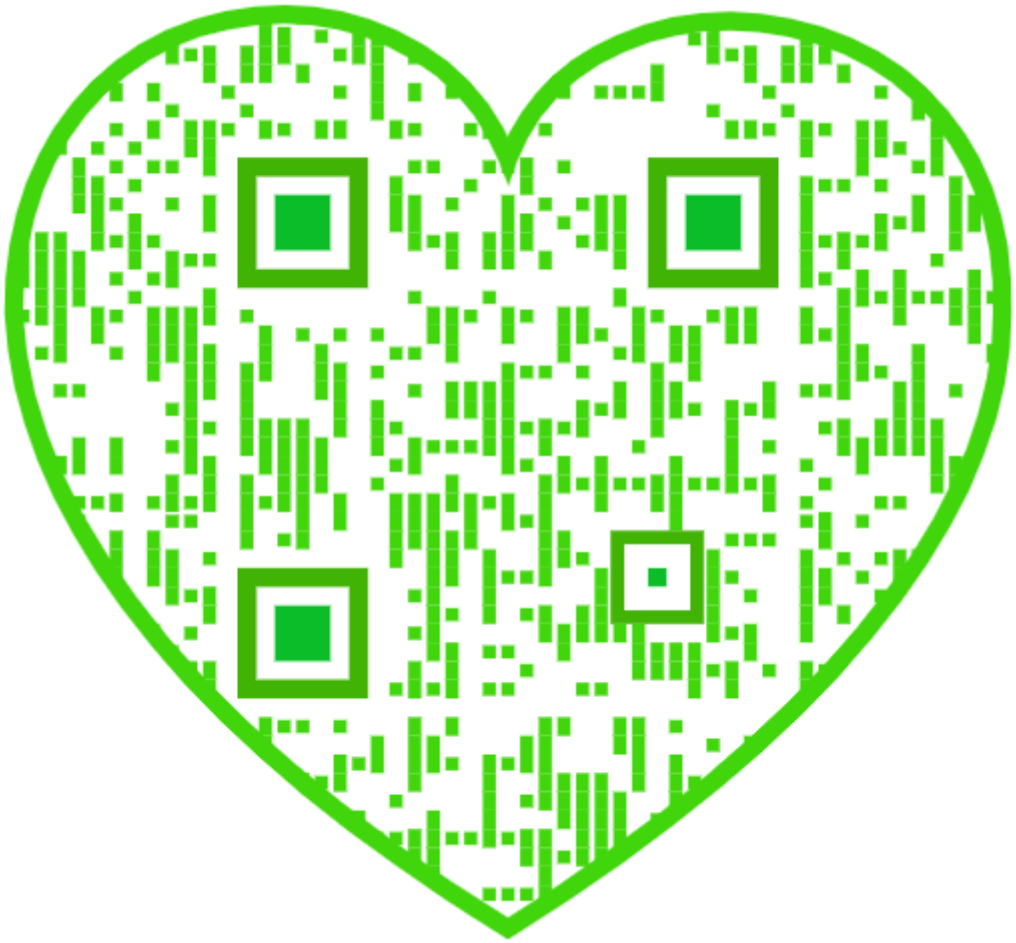

may then be recovered from the old solution, by evaporating it to dryness, and fusing the residuum with a small piece of soda or potash, the gold being fused into a button. The addition of a little saltpetre will tend to make the refining process more complete. As there is some trouble connected with this process, it is scarcely worth adopting where very small quantities of gold are concerned. In such a case it is a better plan to suspend the article, from which the gold is to be removed, in the gilding bath in the place of the anode when gilding another article.

THE APPLICATION OF STEAM TO CANALS.---NO. 3.

BY GEORGE EDWARD HARDING., ESQ., C.E.

In 1818, John Scott patented an arrangement by which forked poles, operated by wheels, push against the bottom of the canal, and, in case the depth is unusual, broad vanes, at the ends of the poles, thrust against the water, and are lifted into the air for the return. We also find in this year hinged floats fixed to a reciprocating chain under the vessel Two years later, George Lilley and James Fraser recommend the application of a forcing pump to constantly supply water to a cistern upon the deck of a boat; while, by means of a condensing air pump, the pressure of the air in the cistern is increased until the force of a stream of water, conducted from the bottom of such cistern to the stern of a boat, shall drive the vessel forward. Vanes driven by an engine, and oscillating through a part of a revolution in an air tight cylinder or drum floating upon the water, are also found to propel a boat, by alternately receiving water on one side of the vanes and discharging it from the other; and, in this same year, a sanguine inventor claims applying the paddle wheels astern, or in the rear of the vessel, and so arranged that the part of the vessel which carries the machinery may be separated and applied to the stern of any number of vessels in succession to propel them.

The next year, we have four inventions. The first places the propelling wheels in a horizontal position at one side of the deck, with floats feathering as they return, folding against the periphery of the wheel by means of suitable levers, cog wheels, and inclined planes, and thus preventing resistance to the water. The second revolves one or more pair of paddle wheels in channels or sluices in the vessels; whilst the third, disdaining the aid of steam, operates paddles entirely upon the treadmill system. The last is a repetition of the endless chain and floats. In 1822, the Brothers Binns claim the application of a rotary steam engine, with wheels feathering the floats by reason of loading the bottom edges of the paddles proportionate to their surface, which hardly seems certain in action at even a medium rate of speed; and a few months after, we have one of the earlier claims for increasing speed by the use of geared engines, though not specially claimed as applicable to inland navigation. In February, 1824, Moses Isaacs, whose name inclines us to the belief that he was of Jewish extraction, patents a swinging "fiery" furnace, which alternately heats three boilers, while the steam from the cylinders is received by the boilers first heated and now cooling. This scheme is decidedly visionary. An "icthyodic oar" is next claimed by one Busk, which he describes as a wedge, between two planes under water, moving back and forward, turning on an axis through its thick end, and so as to touch with its sides each plane alternately. Valves admit the water, and close when the wedge forces the water against them. The oblique pressure of the sides of the wedge on the water propels the vessel. In a modification of the above, a wedge is caused to move up and down in the water with its thick end forward, and its edge horizontal, and includes in the specification revolving cones, with their axes horizontal and points turned towards the stern. He also presents as a novelty the pumping of water through tubes which, in his fondness for original names, he baptises as a "Hydropetic propellent," and the very next month, in partnership with James Neville, he desires protection for drawing along a boat by opening and shutting planes fixed at the bows after the manner of the covers of a book, and also claims forcing air through tubes against the water. Two months later, this same irrepressible William Busk appears as the inventor of a method of propulsion evidently taken from the action of the tail of a fish. An elastic plate, fixed at one end to an axis, is caused to vibrate back and forward in the water, or two such plates revolve from a projecting shaft at the stern; but Busk, with all his ingenuity of devices and nomenclature, does not appear to have realized either fame or fortune, and he subsides for a couple of years, when he brings up two other arrangements, quite as theoretical and impracticable as any that preceded them.

The first record of invention in which, by a chain lying in the water of the canal, fast at one end and passing round a wheel on board the vessel, which wheel is turned by machinery, the boat is propelled, leaving the chain behind on the bottom, is found in Samuel Brown's claim of March 15th, 1825, and is worthy of note, having been received at various periods, and even reported at the present time as in use in Holland. The disadvantages of this system in regard to passing locks and bends of the canal militate against it. As a modification of this principle, we were lately shown a plan whereby a heavy chain was tried on the Bridgwater Canal, but instead of using a direct pull as the propelling power, the chain was taken on board over the bow, and lowered, with considerable slack, vertically over the stern, the gravity of the hanging loop being expected to move the boat forward. It is unnecessary to add that this failed as a practical means of propulsion.

In this year John and Samuel Seaward patent the employment of a wheel or wheels placed in an opening or well through the bottom of the boat, and revolving upon the canal bottom, or against the sides thereof, and by that means to propel or draw the vessel forward. These wheels were provided with projecting knobs on their peripheries, in order to take a firm hold of the ground, or, if desired, projecting arms or radii could be used, in which latter case the arms were arranged to slide in and out of hollow spokes, so as to freely compensate for inequalities of the bottom. We can imagine some difficulties and considerable mud involved in the practical solution of this problem. Next year we have paddle wheels at the bow or stern, which lift on deck for convenience in lockage, and also the employment of kites for drawing vessels; the multiplication of these kites was to give "indefinite power," and very indefinite it would be surely, not perhaps in the sense intended by over sanguine inventors.

Congreve's device we have already mentioned. This patent issued in 1827, comprises a broad, thick band of sponge around a cylinder free to revolve in the water. The water rises into this band on one side by capillary attraction, and an endless chain compressing the band by its weight on the other squeezes the water out. The difference in weight between the two sides causes the cylinder to rotate and to draw the vessel on, or to move paddles to propel it. Glass or metal plates may be used to create the capillary attraction, and mercury in a tank instead of water. No boats on this system are known to be in use. This year also brings out an invention for propelling boats by setting in motion the system of levers commonly known as "lazy tongs," and probably intended to have hinged floats at its extremities; and, three months later, an idea is made public where hinged vanes, obtaining their reciprocating motion from rocking shafts, are employed.

In 1829, two spirals at the stern of a boat, and covered by removable plate iron cylinders, to protect the banks from injury, is claimed by Julius Pumphrey; in 1831, a scroll shaped propeller, revolving in a scroll shaped case, by William Hall; while, in 1832, Woodcroft patented his increasing pitch screw propeller, applied at the side or at the stem of a vessel or boat; but what Fulton did for the paddle wheel in America, and Bell in England, namely, its practical introduction, we must award to Ericsson in respect to the screw propeller. Captain John Ericsson, as the first actual demonstrator of the submerged screw propeller, in 1837, has afforded us a means for propelling boats on narrow water ways, without the disadvantages arising from the use of paddle wheels operating upon the water surface; for although, besides those lately mentioned, Bramah, in 1785, patented a screw propeller on the principle of the sails of a windmill or the blades of a "smoke jack," Littleton, in 1794, Fulton, in 1798, and Edward Shorter, in his claim for "a perpetual sculling machine," in 1800, yet to Capt. Ericsson is due the credit of the first successful improvement, carried out in May, 1837, on the *John O Sergeant*, with a double propeller, though his patent is dated nearly a year previous. The success of this steamer induced the construction of the *Robert F. Stockton*, which, though provided with a double propeller similar to the *Sergeant*, was as frequently worked with one only. After several trials of her powers in England, she crossed the Atlantic in 1839, where she was at once sold to the Delaware and Raritan Canal Company for towing their boats. The value and importance of the screw to navigation having been clearly demonstrated of practical value, a number of screw boats were put on the lines of inland navigation which connected Lake Ontario and the St. Lawrence *vid* the Welland Canal, and also on the route of the Chesapeake and Delaware Canal, which united the Chesapeake Bay and the southern waters with the River Delaware and the north. As instancing the capability of canals even in competition with railways, we find, according to Woodcroft, that the introduction of the small screw steamer, the *Ericsson*, between Philadelphia and Baltimore, by the inland route of the Chesapeake and Delaware Canal, completely ruined the goods traffic of the Philadelphia and Baltimore Railway. In the competition with this single vessel, the railway was compelled to reduce its passenger fares one half, and even with the attempted aid of the State, it lost its entire freight business. Capt. Ericsson also built, in 1839, an iron screw propeller, named the *Enterprise*, to run as passenger boat on the Ashby-de-la-Zouch Canal, but the introduction of railways prevented her being profitable for this purpose, and she was afterwards used to tow coal barges on the Mersey and Trent navigations with entire success.

Returning to our inventors, we find Sir John Scott Lillie patenting, in 1836, the application of atmospheric railways for towing canal boats, but the practical inconveniences which have hitherto prevented the use of locomotives along the canal banks for the same purpose would hold ground as strongly here. Intending to overcome all objections, an enthusiastic American started a joint stock company, about two years since, for the purpose of constructing an elevated double railway over the line of the Erie Canal and its branches, from which the boats underneath could be towed at any speed; but the estimates of cost certainly exceeding four and a half millions, while the dividends were not so positive, there yet remains opportunity for English subscribers to invest. However, this only goes to prove the awakening to the necessity of applying to canals some of the attention and improvements so liberally bestowed on all other carriage systems, and, sooner or later, a fortune will reward the lucky inventor who shall solve the great problem of canal propulsion. In case of the ordinary shaped boat being dragged along the canal by steam towage, any increase of speed, commensurate with the expense incurred, will create a wave more destructive to the banks than the use of an ordinary propeller, so that any system of railway towing requires the adaptation of a complete fleet of boats specially devised for high speeds with small resistance. For the tables on the resistance of canal boats at different speeds and the disturbance of the water surface, reference is advised to the experiments of Stevenson in 1818, of Beran in 1832, of Palmer, as published in the first volume of the "Transactions of the Civil Engineers" with Professor Barlow's report thereon, and those conducted by McNeil on behalf of the proprietors of the Forth and Clyde Canal.

Worcester Manufacturers.

The Boston *Commercial Bulletin* keeps its readers well posted on New England manufactures. We copy from it the following items relative to Worcester (Mass.) industries

The Phœnix Plate Company are engaged in manufacturing black and patent chocolate tinted ferrotype plates, in egg shell and glossy surfaces, also japanned iron sheets in different sizes for sign painters' use. H. M. Hedder is the proprietor and patentee of the business, commencing a few years ago with three men; he now employs thirty. The iron plate is imported from England, as it cannot be produced in this country; only one firm in England knows the peculiar process for making it. It is coated with a varnish and then baked on, and is now used entirely as a substitute for a cheap picture, and is taking the place of the old style of daguerreotype and ambrotype pictures. There are only two firms engaged in this business in the United States.

At the Wesson Rifle Works are manufactured breech loading rifles, sporting guns and pistols. The proprietor, Frank Wesson, has an extensive experience in the manufacture of firearms, and claims to make an excellent article. The Wessen rifle attained a wide notoriety during our civil war, it being used to a great extent by the cavalry and sharpshooters. A new rifle, double barrel and breech loading, with one barrel for shot and one rifle bore, is attracting much attention from sporting men; also a patent target pistol, with a detachable shoulder rest. These are among their specialties; and thirty men are employed.

Something important to all wood-working establishments is the McClelland patent blower and duster. It consists of a fan blower, which can be located in any part of the building, with tubes or box pipes running from above each planing or molding machine or circular saw, by which all dust and shavings are conveyed into a main pipe and carried into the boiler room and fed under the boiler or run into a shaving room. This has long been needed, and is in use in many of the principal wood-working establishments in Burlington, Albany, Philadelphia, and other places.

The firm of Russ & Eddy has been engaged, in the manufacturing of picture frames and house moldings in walnut, chestnut, pine and hard wood, eight years, now using 250,000 feet annually of black walnut lumber. They employ twenty men, and occupy a building on Manchester street. A forty horse power engine, made by Tufts, of Boston, and a sixty horse boiler, made by Allen & Endicott, of Boston, furnish the power. They are also putting in a McClelland patent blower and duster.

In order to keep the ball rolling, R. Ball & Co. have recently occupied their new building, and will continue to make their articles of woodworking machinery. The building is 175 feet by 45, five stories, well lighted and supplied with the facilities for a large amount of work. The shafting and pulleys were furnished by Wood, Light & Co., of Worcester; a building thirty by thirty, two stories, is used as a dry room and boiler room; a new sixty horse engine, built by Charles Brown, of Fitchburg, supplies the power; the elevator was built by Otis Brothers, of Yonkers, N. Y.; and 100 men are employed.

The Phenomena of Vibration.

A simple apparatus for the observance of some beautiful phenomena can be constructed as follows: A disk of white cardboard, with apertures oblong in radial direction, is set on a spindle, so as to be rotated at any requisite speed. To examine, for instance, the flame of a gas light (in a glass tube, to prevent disturbance by air currents), place the disk in front of the light, so that the eye can see the light through each slit as it comes to a vertical position. If the speed of the disk's rotation is such that the interval of time between two slits passing the eye is just equal to the period of a vibration of the flame, the flame appears to be motionless; but if the velocity be reduced, the flame is seen to go slowly through its changes of form. If the interval be equal to, or one half of, or one third of, the period of the vibration of the light, the illusory appearance of a disk having as many, or twice or three times the number of, slits really in the disk is seen. This phantom disk will appear to be motion less when the periods coincide;
volves in one direction or the other. It is obvious that the vibrations of the flame can be easily counted by this means. The inventor, Mr. Charles J. Watson, counted, with a sixteen inch tube, 453 vibrations of the flame per second. By this instrument, the undulation of the vibrations of a wire can be seen to travel up and down the wire; and if watched by both eyes through the slits, the spiral course of the ulations can be observed.

PRESERVING STONE FROM THE EFFECTS OF DAMP AIR.—The obelisk of Luxor, now standing in the Place de la Concorde, Paris, has been much damaged in appearance, and numerous cracks have appeared on its surface. All this deterioration has taken place during the last forty years, the previous forty centuries of exposure to the dry Egyptian air having left it as perfect as when new. Dr. Robert, of Paris recommends washing stone with a solution of a salt of copper, a method which seems to us to be practical and good, and of which we should like to know the results of a trial. It would destroy the minute lichens which disfigure our garden statuary with unsightly patches of green.

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Protoplasm again.

The following paper on "Protoplasmic Life" was read on May 4, before the Royal Society, by Mr. F. Grace Calvert, F.R.S.:

A year since the publication of Dr. Tyndall's intere ting paper on the abundance of germ life in the atmosphere, and the difficulty of destroying this life, as well as other papers published by eminent men of science, suggested the inquiry if the germs existing or produced in a liquid in a state of fermentation or of putrefaction could be conveyed to a liquid susceptible of entering into these states; and although at the present time the results of this inquiry are not sufficiently complete for publication, still I have observed some facts arising out of the subject of protoplasmic life, which I wish now to lay before the Royal Society.

As a pure fluid, free from life and having no chemical reaction, was essential to carrying out the investigation, I directed my attention to the preparation of pure distilled water. Having always found life, in distilled water prepared by the ordinary methods, by keeping it a few days, after many trials I employed an apparatus which gave satisfactory results, and enabled me to obtain water which remained free from life for several months.

The water had to be re-distilled three or four times before it was obtained free from germs, and it was then kept, in the apparatus in which it was distilled, until wanted, to prevent any contact with air.

Some water which had been distilled on the 20th of November, 1870, being still free from life on the 7th of December, was introduced by a siphon into twelve small tubes, then left exposed to the atmosphere for fifteen hours, when they were closed. Every eight days some of the tubes were opened, and their contents examined. On the fifteenth, therefore, the first examination was made, when no life was observed; on the 23d, two or three other tubes were examined, and again no life was detected; while in the series opened on January 2, 1871, that is to say, twenty-four days from the time the tubes were closed, two or three black vibrios were found in each field. Being impressed with the idea that this slow and limited development of protoplastic life may be attributed to the small amount of life existing in the atmosphere at this period of the year,* a second series of experiments was commenced on the 4th of January. The distilled water in the flask being still free from life, a certain quantity of it was put into twelve small tubes, which were placed near putrid meat at a temperature of 21° to 26° C. for two hours, and then seale On the 10th of the same month the contents of some of the tubes were examined, when two or three small black vibrios were observed under each field. This result shows that the fluid having been placed near a source of protoplasmic life, germs had become impregnated in two hours in sufficient quantity for life to become visible in six days instead of twenty-four.

Other tubes of this series were opened on the 17th of January, when a slight increase of life was noticed, but no further development appeared to take place after this date, as some examined on the 10th of March did not contain more life than those of the 17th of January.

[This very limited amount of life naturally suggested the idea that it might be due to the employment of perfectly pure water, so that Mr. Calvert commenced a third series of experiments.]

On the 9th of February 100 fluid grains of albumen from a new laid egg were introduced as quickly as possible, and with the greatest care, into ten ounces of pure distilled water contained in the flask in which it had been condensed, and an atmosphere of hydrogen kept over it. On the 16th some of the fluid was taken out by means of a siphon, and examined, and no life being present, twelve tubes were filled with the fluid, exposed to the air for eight hours and closed. On the 21st the contents of some of the tubes were examined, when a few vibrios and microzyma were distinctly seen in each field. On the 27th other tubes were examined, and showed a marked increase in the amount of life. In this series, in which a fermentable substance was employed, life appeared in five days, and an increase in ten, instead of requiring twenty-four days, as was the case when pure water only was employed.

As the weather had become much warmer, and a marked increase of life in the atmosphere had taken place, some of the same albumen solution as had been employed in the above experiments was left exposed in similar tubes to its influence, when a large quantity of life was rapidly developed, and continued to increase. This result appears to show that the increase of life is not due to reproduction merely, but to the introduction of fresh germs; for, excepting this fresh supply, there appears to be no reason why life should increase more rapidly in the open than in the closed tubes.

* During the intense cold of December and January last, I found it took an exposure to the atmosphere of two days at a temperature of 12° C. before life appeared in solution of white of egg in the pure distilled water, while as the weather got warmer the time required became less.

How many Hours Constitute a Day's Work?

Looking at the matter solely from a selfish and pecuniary point of view, says the *American Builder*, it appears that the requirement of the greatest number of hours is sometimes equally to the disadvantage of employer and employed. There are classes of work of which more can be performed in eight hours than in ten, especially work requiring great physical exertion. An instance of this was lately afforded in the construction of a railroad bridge in Missouri. There the manager of the work, wishing to compare the merits of the eight and ten hour systems, adopted each in succession, and it was found that by the first plan much more work was performed. The character of the labor was physically exhausting in the extreme, and when the men were required to work ten hours a day, they moved slowly and sluggishly, the rest of a night not sufficing to recover from the long-continued exertion; but when only eight hours were exacted, they had ample time for rest, and worked earnestly, being fully equal to the quick, heavy labor required of them. On the ontrary, in many kinds of work of a less exhausting nature, there is no doubt that the hours of labor would be no more than could be performed with ease by either sex.

No general rule can therefore be given to determine the hours which may b said to constitute a working day, but could some limits be fixed, varying with the different conditions under which work is performed and intended to be a guide rather than a law, something would doubtless be achieved towards solving a problem which is now puzzling alike to employer and employed.

Milk Coolers.

A milk cooler for general use among dairy farmers should combine, if possible, the following nine points of excellence: First, it must be low priced, that all may be induced to buy and use it; second, possess the power of performing the largest amount of cooling with the least possible amount of cooling material, whether water, air, or ice, in order that all farmers may possess the means of application; third, easily kept clean; fourth, it must present ample facilities for aerating the milk, in order to allow the contained gases, or animal odor, as it is commonly called, to escape; fifth, durability, as no one will use a cooler if it must be renewed every year; sixth, it should be simple of construction; seventh, not liable to get out of repair; eighth, it must be easy of appli cation, so that children or any body else can use it; and ninth, it most be so arranged that the cooling may be continued, or the intensity of the cold increased, so as to enable those using it to keep their milk over night during extremely hot weather. In our opinion, a perfect cooler for the use of the dairy farmer for cooling and deodorising his milk as soon as drawn from the cow, and at the same time enabling him to keep it through our hottest summer nights with safety, has not yet been brought out, neither will be, until one is constructed combining all nine of the points of excellence above written. Therefore, in selecting a cooler, our advice is to get that one which combines the most of these points, particularly the second, fourth and ninth, as its efficiency as a cooler depends so much on its perfection in these three points, that a failure in any one is a radical defect, and should condemn it at once.

There is, we presume, little need of our urging upon dairy farmers the necessity of using tin pails for milking, since so much has been already said and written in that direction; in fact, we regard utensils made of wood as being totally unfit for use about milk, and would recommend the substitution of tin, stoneware, glass, or porcelain in all places where practicable; and for ourselves we will not admit the use of wood utensils about the dairy, excepting for churns and butter tubs.

Galvanized iron and zinc utensils are objectionable, for the reason that acids act so readily and powerfully on the zinc, causing such a variety of changes through the galvanic agency thus developed, producing decompositions and recompositions difficult to control and unpleasant in results.—*Anson Bartlett.*

Formation of Gold Nuggets.

Mr. C. Wilkinson announced lately to the Royal Society of Victoria that gold when placed in a solution of its chloride undergoing decomposition by contact with organic matter, determines the deposit of much or all the liberated gold up on itself. This fact, first observed by Mr. Daintree, he assumes as accounting for the formation of nuggets. Mr. C. Wilkinson also found that copper, iron, and arsenical pyrites, galena, zinc blende, stibmite, wolfram, and molybdenite, also act as nuclei for gold thus reduced, but that brown iron ore and quartz do not. These results have been verified by a critical inquiry conducted by Mr. C. Newberry, analyst to the Geological Survey.

Mr. W. Skey, analyst to the Geological Survey of New Zealand, has communicated to the Wellington Philosophical Society a number of experiments on the same subject. He eliminated the cases of wolfram, etc., as being due to the presence of soluble proto-salts of iron, etc., and therefore had only to investigate the metallic sulphides and arsenides. On pursuing the subject, to his surprise he found that cubes of galena were perfectly gilt when placed in solutions of gold, withont the intervention of any organic matter whatever. This direct reduction he has also effected by proto and bisulphides of iron, sulphides of copper, the sulphides of zinc, tin, molybdenum, lead, mercury, silver, antimony, bismuth, ar senic, platinum and gold, and among the arsenides, mispickel and arsenide of silver. While allowing therefore that organic matter has had a share in the reduction of gold, he thinks that by far the greater portion of our gold and silver deposits, especially those situated in the deeper seated rocks and lodges removed from carboniferous strata, have been wholly due to the deoxidising effects of pyritous minerals.

Manufacture of Spring Knives.

Few people, says the *Mechanics' Magazine*, have any idea through what a number of hands their pocket knives have passed in the process of manufacture. A bar of steel destined to furnish a number of blades is heated to redness. A length is cut off, and the forger speedily "moods" this, that is, shapes it roughly into the form of a pocket knife blade. Another heating is then required to fit the end for being fashioned into the tang, and yet another before it can under go the further operation of "smithing," the last stage of which is the stamping of the mark of the thumb nail to facilitate opening. The tang is then ground, and the blade marked with t e name of the firm. The slight bulge on the reverse side caused by this operation is removed by fire or the grindstone. The blade is then hardened by heating it to redness and then plunging it into water up to the tang. The tempering process follows next, the bluish yellow tint being considered as indicating that the proper degree of heat at which to immerse the blade once more in cold water has been attained. After this the various kinds of blades are classified in the warehouse, and undergo sundry grinding operations to fit them for being hafted. Twelve distinct processes have by this time been gone through, and many more are necessary before the knife is completely finished, although the number of hands which it has now to pass through depends in a great measure on the finish to be given to the handle, according to the quality of the blades with which it is fitted, and the price which the completed article is intended to realize.

Sunstroke.

Dr. Geo. H. Hope, M. D. in his little work entitled "Till the Doctor comes and How to Help Him," gives the following directions for the treatment of sunstroke until medical aid can be obtained.

SUNSTROKE.—This is a sudden prostration due to long exposure to great heat, especially when one is much fatigued or exhausted. It commonly happens from undue exposure to the sun's rays in summer, but I have seen the same effects produced in a baker from the great heat of the bake room. It begins with pain in the head or dizziness, quickly followed by loss of consciousness and complete prostration. Sometimes, however, the attack is as sudden as a stroke of apoplexy. The head is often burning hot, the face dark and swollen, the breathing labored and snoring, and the extremities cold. Take the patient at once to a cool and shady place, but don't carry him far to a house or hospital. Loosen the clothes thoroughly about his neck and waist. Lay him down with the head a little raised. Apply wet cloths to the head, and mustard or turpentine to the calves of the legs and the soles of the feet. Give a little weak whiskey and water if he can swallow. Meanwhile let some one go for the doctor. You cannot safely do more than I have said without his advice.

Prolonged Vigils.

Leibnitz sometimes passed three consecutive days and nights in the same chair, resolving a problem that interested him; an excellent custom, as Fontenelle observes, to accomplish a labor, but a very unhealthy one. The Abbé de la Caille, a famous astronomer, had a fork invented in which he adjusted his head, and in this position passed the night in astronomical observations, without knowing any other enemies than sleep and the clouds, without suspecting that there could be any more delightful way of employing those silent hours which revealed to him the harmony of the universe. Thus he contracted an inflammation of the lungs which carried him off in a short time. Girsdet did not like to labor during the day. Seized in the middle of the night by a fever of inspiration, he arose, lit the chandelier suspended in his studio, placed upon his head an enormous hat covered with candles, and in this strange costume he painted for hours. No one ever had a feebler constitution, or a more disordered state of health than Girsdet.

EXTRACT OF MEAT.—The following is the examination of the value of extract of meat, according to Professor C. Reichardt: According to Liebig 60 per cent of the weight of the extract should be dissolved in alcohol of 80 per cent. Good extract, dried at 100° C. should lose no more than 16 per cent. of its weight in water. Ether should not take up from the extract any, or at least exceedingly small, quantities of fat. The solutions should not contain any albumen, which remains as coagulated albumen in the residue which cannot be dissolved by water and alcohol. Good extract should con tain from 6·5 to 10 per cent of nitrogen, and from 18 to 20 per cent of ashes which are rich in potash, 5·5 to even 9 per cent of the weight of extract, and phosphoric acid 2·7 to 6 per cent.

CHALKING JOINTS IN GLUEING END WOOD.—A correspondent in Wisconsin, a pattern maker of large experience, questions the efficacy of this method of securing a reliable joint in glueing the grain ends of wood. He says that he has tried it thoroughly years ago, and has found it not reliable, and that no method is so sure as to size the ends with glue first and then make a smooth face before glueing permanently

THE appointment of fire coroners to hold an inquest on every fire, to protect the public and the companies, is advocated. It is urged that if the payment of a policy were conditioned on the production of an official certificate, stating that investigation showed the loss to result from accidental fire, risks and premiums would largely fall.

THE California barley this season will be an average crop, and the wheat about two-thirds. The vintage will be the largest ever known, and the other crops are good throughout the State.

FURNITURE POLISH.—One pint of linseed oil, one wine glass of alcohol; mix well together; apply to the cloth with a linen rag; rub dry with a soft cotton cloth, and polish with a silk cloth. Furniture is improved by washing it occasionally with soapsuds. Wipe dry and rub over with a very little linseed oil upon a clean sponge or flannel.

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BLOWING OUT OF THE EAST CAISSON OF THE EAST RIVER BRIDGE.

[From the Report of the Chief Engineer.]

In the original design for the caisson it was the intention to make the air chamber one vast unbroken space, without dividing or supporting frames of any kind, reliance being placed upon the solid timber platform of 15 feet thickness to transfer all strains equally from the shoe inward. To diminish the work above, the masonry was to be built inside of a wooden cofferdam placed on top of the caisson.

This programme was quite feasible theoretically, provided the air pressure could be maintained at the proper standard without possibility of failure, and provided the caisson was sunk through a soft uniformly yielding material. The shoe and sides of the caisson were made strong enough to resist the overweight occurring at each low tide.

The requirements of launching however, make it necessary to introduce five heavy trussed frames to serve as launching frames; they divided the caisson into six chambers, each frame being also well braced from the sides. These frames were allowed to remain in, large openings being cut in them for passage to and fro.

Subsequent events proved the necessity not only of these frames, but of double the additional support.

Very little attention was paid to the matter of supports at first; any irregular bearing below was easily distributed by the roof, even to the extent of having entire frames unsupported at a time. The wooden blocking on which the caisson was supported, proved sufficiently elastic to yield without crushing to any extent.

As the caisson sank deeper much of the dirt coming out was dumped on top of it, filling up all spaces not occupied by masonry. This was only the beginning of the overweight to be carried ultimately. Again, at very low tides, the overweight caused by them was equal to the weight of a volume of water 168x102x7 feet, amounting to 3,700 tons alone. This overweight kept slowly increasing until, one Sunday morning about 6 A. M., the south water shaft blew out, every particle of compressed air leaving the caisson in an instant. To say that this occurrence was an accident would certainly be wrong, because not one accident in a hundred deserves the name. In this case it was the legitimate result of carelessness, brought about by an over confidence in supposing that matters would take care of themselves. The immediate cause of the blowing out lay in the washing away of the dam around the pool under the shaft. These dams washed away frequently at subsequent periods, but we had had our experience and our lesson, and were prepared for it. There was, unfortunately, no man in the caisson at the time, so that that experience is lost. Eye witnesses outside state that a dense column of water, fog, mud, and stones was thrown up 500 feet into the air, accompanied by a terrific roar and a shower of falling fragments, covering the houses for squares around. This column was seen a mile off. The noise was so frightful that the whole neighborhood stampeded and made a rush up Fulton street. Even the toll collectors at the ferry abandoned their tills. There were three men on the caisson at the time, including the watchman. He reports that the current of air rushing toward the blowing water shaft was so strong as to knock him down; while down he was hit in the back by a stone, and further than that he does not remember. One of the other men jumped into the river, and a third buried himself in a coal pile. It was all over in a minute. Both doors of the air lock fell open. The dry bottom was visible through the air and water shaft; not a particle had entered under the shoe into the air chamber, and for the first and only time the caisson could dispense with artificial illumination. As soon as possible a stream of water was passed into the shaft from above, the locks were closed, and in the course of an hour the pressure was restored to fifteen pounds, corresponding to a head of thirty-one feet.

The first entry into the caisson was made with considerable misgivings, but none of our fears were realized.

The total settling that took place amounted to ten inches in all. Every block under the frames and posts was absolutely crushed, the ground being too compact to yield; none of the frames, however, were out of line. The brunt of the blow was, of course, taken by the shoe and sides of the caisson. One sharp boulder in No. 2 chamber had cut the armor plate, crushed through the shoe casting and buried itself a foot deep into the heavy oak sill, at the same time forcing in the sides some six inches. In a number of places the sides were forced in to that amount, but in no instance were they forced outward. The marvel is that the air tightness was not impaired in the least.

The nine courses of timber forming the sides of the air chamber were permanently compressed to the extent of two inches, as was shown by protruding bolt heads and the shearing off of a number of diagonal bolts. The lower sills of the frames were also torn where they came upon boulders.

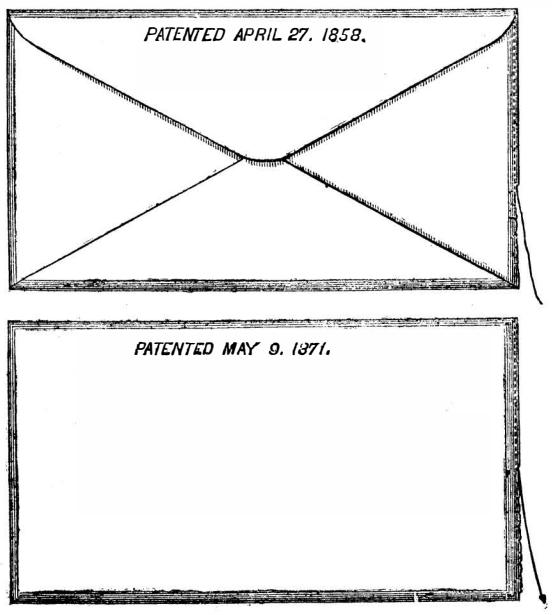
The weight of the caisson at the time was 17,675 tons. The air blew out so suddenly that this weight must have acted with considerable impact in falling through the space of ten inches. The bearing surface at the time was as follows: The four edges of the caisson, 550 feet long and seven inches wide, amounting to 322 square feet; the five frames each 100 feet long and one foot wide, resting on twelve blocks one foot wide, amounting to sixty square feet and giving a total of 382 square feet to meet the above pressure. This at the rate of forty-six tons per square foot.

But more than one half of the shoe was undermined to a depth of one foot or more, which reduced the practical bearing surface by nearly one half. At the commencement of the shock there was therefore a pressure of eighty tons per square foot, no allowance being made for impact, which may have doubled this rate. The caisson had settled ten inches. The shoe had buried itself so as to present a width of twelve inches, and through the crushing of the blocks the frames were in many places resting bodily on the ground, The settling had therefore stopped when a bearing surface of 775 square feet had been reached, giving a pressure of twenty-three tons per square foot.

VAGARIES OF THE PATENT OFFICE.

It will be seen from the following that the ever popular inquiry as to the difference between tweedledum and tweedledee has been adjudicated by the Patent Office, and that a patent has been granted for the difference.

In 1858 Charles Phelps, of Salem, Mass., obtained a patent for a letter opener, consisting of a thread placed in the crease of the envelope, as shown in the upper figure of our engraving. To open the envelope, you pull the thread so as to make it cut the paper. His claim, which is a good one, appears to cover the whole subject, and is as follows:

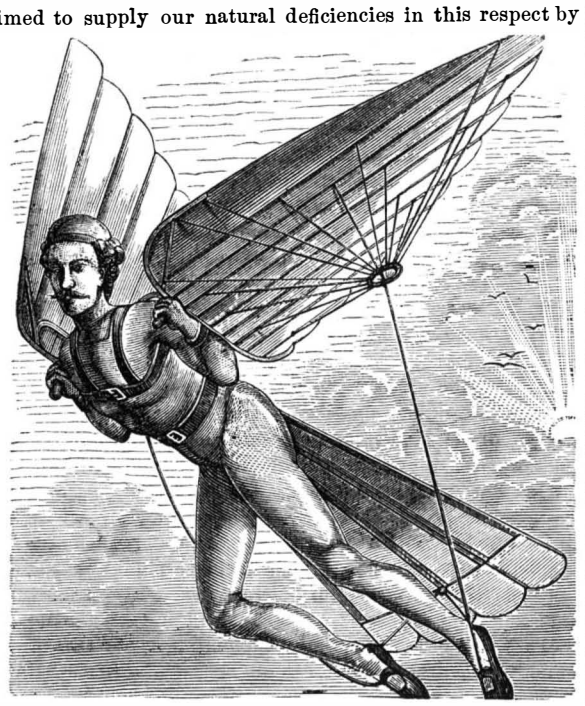


"I claim the application to a letter envelope of an opener therefor, said opener to be attached to, and form part of, said envelope, and to be attached and operated substantially in the manner set forth and described."

The unsophisticated mind would naturally suppose that whether one selects a thread from a spool or a knotted thread from a lady's needle, involves no perceptible difference; but the Patent Office regards the subject from a more profound point of view. If the reader will take a magnifying glass and closely scan the second figure in the cut, a small knot will be discovered on the extremity of the thread, for which knot a patent was granted to Henry K. Gregg, of Baltimore, Md., May 9, 1871. He claims an envelope made with a cord imbedded wholly in the inside of the end or side thereof, providing the cord with one or more knots on either or both ends thereof, substantially as and for the purposes described.

FLYING MACHINE.

Somebody has defined man to be a species of featherless birds. The inventor of the device illustrated herewith has aimed to supply our natural deficiencies in this respect by



the provision of wings and tail, attached and operated as indicated. We hardly think he will be able to compete with the swallows in this harness, and would advise him to start from some low point at first, so that, if he should fall down, it will not hurt him much. However, we may say that the principle of calling into play the strong muscles of the thighs to aid the arms in the movement of wings, as shown, is taking advantage of the greatest power the human body can exert, and in this respect the device is an improvement upon some other attempts. The method of connecting the rope to the various parts of the wing, is also such as gives least strain to the various parts. The machine is the invention of W. F. Quimby, of Wilmington, Del.

Resources of the North-west.

Says the *American Exchange and Review:*

Puget Sound, on the borders of which will be the future metropolis of the North Pacific coast, is an inland sea, dotted with islands, and joined to the Pacific by a gateway called the Strait of Fuca, 80 miles in length, 10 to 12 in width, and from 20 to 100 fathoms deep in all its parts. One arm of the sound extends northward from where it joins the strait, and the others southward; both divide and ramify, until the sound, with all its bays and deep water inlets, presents a shore line of 1,833 miles, and extends across two degrees of latitude. There is no obstruction at the entrance. The mouth of the strait is easily entered in all weather. For 150 miles the mid channel is more than 300 feet deep, and remarkably free from all hidden dangers. On each side of the main channel, and in the various bays which will be the real harbors and shipping ports, the water is still deep, but not too deep for anchorage. The holding ground is excellent. The waters abound with fish of great variety and excellence. The cod banks of Alaska are now known to be as extensive and productive as those of our Atlantic coast. These fisheries are necessarily tributary to the trade of Puget Sound. Besides, the climate of Washington territory offers for curing fish just the required medium of temperature—an average of 40 degrees in winter and 62 degrees in summer. The fisheries are 800 miles nearer the drying racks and the shipping ports of Puget Sound than to those of San Francisco. These advantages will govern the location of the fishing trade. The best whaling ground left to American harpooners is within eighteen days of the western terminus of the Northern Pacific railroad. The basin containing the Sound and its branches is bounded on the east by the cascade range of mountains, and sheltered on the west by the Olympian or Coast range. This depression between the two mountain ridges is about 75 miles in width, and that part which is not occupied by the waters of the Sound is mainly covered with magnificent forests, which extend to the very summit of the mountains. Here grows that Puget Sound timber of which so much has been written—fir, cedar, pine, spruce, hemlock, oak, maple, cotton wood, ash, dog wood, alder, and some of the smaller varieties. The forests of giant fir and cedar are traversed by ten rivers, which flow down from the Cascade mountains and empty into the sound, furnishing ten alluvial valleys of agricultural land, and supplying for logging purposes another thousand miles of inland shore-line. In connection with the remarkable climate (in which twenty varieties of flowers are known to be in bloom at the begining of January) the productive capacity of the soil of the Puget Sound region is great, both as to quantity and quality. Puget Sound is no exception to the wheat yield of the Pacific slope. All the other cereals are grown to perfection; oats are particularly plump and heavy. The small grains are at home in Washington territory. Pork is usually fattened upon peas, wheat, and barley, and, it is claimed, can be made as cheaply as upon corn in the Western States. Fruits of all kinds, except the peach and the grape, are raised in great profusion. Oregon and Washington apples are exported to San Francisco. Potatoes and other vegetables, grown on the north coast, are also in high favor in San Francisco market. The turnip yield will be most abundant.

Electrical Shadows and Images produced by Electricity.

In a paper contributed to the *American Journal of Scienc, and Arts,* Professor Arthur W Wright, of Williams Collegee admits the possibility of the impression of outline images of objects upon the surfaces of other objects, and accounts for these singular phenomena as follows;

The formation of the electrical shadow, discussed in my former paper, as has been suggested by Mr. C. F. Varley, who has more recently obtained results similar to those there described, appears to afford a satisfactory explanation of a singular and very interesting phenomenon, which has occasionally been observed in the case of objects struck by lightning, especially of persons killed by it. A number of instances are on record where the person struck was found to have, impressed upon some portion of the body a delineation of some thing near him at the time of the stroke, and a similar effect has been noticed, also, in the case of inanimate objects. Dr Franklin mentions an instance in which an exact representation of a tree was imprinted upon the breast of a man, who was standing near it when struck by lightning. A number of similar and very remarkable cases are cited in a paper presented to the Royal Society of England, by M. Andrés Poey director of the observatory at Havana.

Mr. Varley also mentions cases, reported by sea captains, of images of certain brass numbers, attached to the rigging of a ship, being printed by the lightning upon the body of persons killed by it, and supposes the brass numbers to have acted as a negative pole in respect to the person struck. But it is unnecessary to suppose that the discharge in such cases always proceeds from the object delineated, and many of the instances recorded forbid such a supposition. The experiments in the production of the electrical shadows show that it is merely necessary that the object should interrupt the lines of action of the electricity, and that it may be at a considerable distance from the electrified cloud, the chief and indispensable condition being that the latter should be negatively electrified. We should then have the body, exposed to the lightning, perfectly electrified by induction, and, as the tension became sufficient, the dark discharge accompanied by the glow would take place, followed by the lightning stroke. If, then, any object should be in the path of the discharge, its image would be formed in the glow, and this might, in rare cases like those recorded, be sufficiently intense to leave a permanently visible impression.

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Lithofracteur.

Lithofracteur—literally stone-breaker—is the patented invention of Professor Engels, of Cologne, and is composed of nitro-glycerin as a base, gun-cotton, the constituents of gun powder, some chlorates, and an infusorial earth. These substances are prepared in a special way, and blended together by special means, these operations being known only to the inventor and the manufacturers, Messrs. Gebruder Krebs and Co., of Cologne. The result of this combination is a black compound of the consistence of soft putty, which is is made up into paper cartridges 4½ in. long by ⅞ of an inch in diameter, and weighing 1¼ oz. each. When lighted in the air by ordinary means, it simply burns out, leaving a light white powder as a residuum; but when it is ignited either in the air or a closed chamber with a capped fuse, its full violence is developed. It is safe under all ordinary and even extraordinary circumstances of storage and transit, as recent experiments in England and lengthened use on the Continent have proved And here we may mention, says *Engineering*, that, although this is almost the first time we in England have heard of this substance, it has been made and extensively used throughout Germany for more than two years past. It was used by the Prussians against the French during the recent war, Herr Engels being the operator After Fort Issy was taken, the Prussians destroyed a number of French heavy siege guns by blowing off their muzzels with lithofracteur.

A notice of this material having appeared in the German papers. the attention of the mining world in England was attracted to it, and a correspondence ensued between the manufacturer and Mr. R. S. France, the lessee of some extensive quarries in England. The result was that arrangements were made for testing the new material, Mr. France offering the use of his quarries, and Messrs. Krebs carrying out the experiments. In order that full publicity might be given to the trials Messrs. Krebs invited the attendance of a number of scientific gentleman, who lately met at Paddington and proceeded to Shrewsbury, near which town Mr. France's quarries are situated.

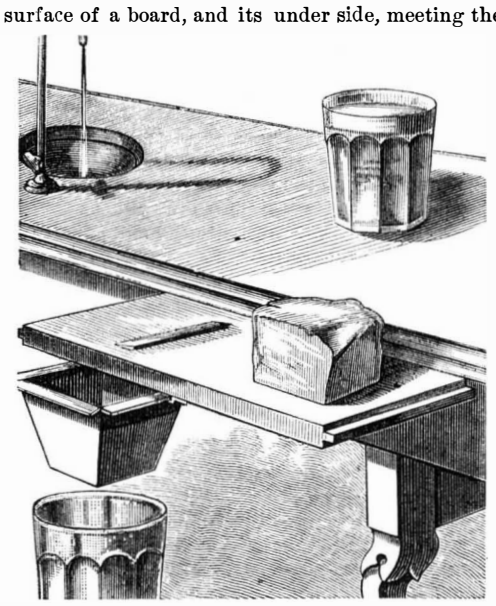
The preliminary experiment consisted in throwing a box containing 5 lb. of lithofracteur, from the top of the quarries at a hight of 150 ft. from the ground, into the plateau below. The box was smashed and the cartridges were scattered about, but not one was exploded. A cartridge was then lighted by an ordinary fusee, when it burned slowly out. Another cartridge was then placed upon a block of stone and fired with a percussion fuse, when a violent report followed, and the top face of the stone was broken off. The power of the lithofracteur when confined was then exhibited by firing charges in the bore holes of several blocks of stone, which were shattered into many fragments. The tamping in all cases was effected with water, thus proving the usefulness and reliability of the compound in workings where wet ground was met with. Another point also proved was, that if a misfire should occur—and one or two did occur in the course of the experiments—the charge could be withdrawn and another one inserted without removing the tamping. And here we may explain that the method of firing is similar to that adopted by Nobel with dynamite and Abel with pulped gun cotton. The capped fuse is simply imbedded in the lithofracteur, the paper of the cartridge being tightly tied round the fuse. The next part of the programme consisted in firing a number of shots, both horizontal and vertical, in the face of the quarry. As these were more or less repititions of each other, we need only notice a few of them, although they all gave extraordinary results. The holes were mostly bored under the direction of some of the mining gentlemen present, who, with the view of testing the compound to the utmost, selected the worst possible spots, some of which, they stated, gunpowder would not possibly touch. The first of these blasts was made with 1 lb. 1½ oz. of lithofracteur, placed in a horizontal bore hole 3 ft. 4 in. deep, and 1½ in. in diameter. A large quantity of stone was blown out to the front, and the face of the rock was scaled and cracked over an area of 20 ft. 6 in. wide by 13 ft. high. A couple more shots were then fired simultaneously near to the last, the bore holes were each 3 ft. deep, and were charged with 13½ oz. and 1lb. ½ oz. respectively, and an immense face of rock was brought down. The best blast, however, was the last of this series; it was fired in a vertical bore hole 4 ft. 6in deep, on a ledge rock, about 23 ft. from the level of the plateau below, 1 lb. 1½ oz. of lithofracteur being used. The explosion brought down at least 20 tons of rock, and loosened an enormous mass behind the bore hole, the shot being one of the finest we ever saw made with so small a quantity of material.

Some experiments were next made with the view of showing the disruptive effect of lithofracteur on iron, and for this purpose a 4 ft. length of 75 lb. double headed rail was laid on its side, being supported at each end at a hight of 3 in. from the ground. A charge of 1 lb. 3 oz. of the compound was placed in a lump on the centre of the rail, and tamped with paper, three old sleepers being placed on the tamping, and fired with a percussion fuze. A startling report ensued, the fragments of the sleepers being sent in all directions, and on examination the rail was found much bent, and with one head cut through, and 11 in. of the web blown away in the center. Had the supports been a little higher, so as to have left room for a greater angle of bend in the rail, both heads would doubtless have been cut through.

So far, with the exception of one or two experiments at the first, the power only of the lithofracteur has been put to the test. It was now proposed to carry out an idea. which originated with Mr. France, to put the compound to the severest possible test in order to prove its behavior under the conditions of a railway collision. To this end, he had an old railway wagon placed on the rails at the bottom of the incline whilst at the top was another, in front of the buffers of which were fixed two cartridges, one on each buffer. Each wagon weighed about 1½ tons, the buffers of both being of wood. The upper wagon being released, started on its journey of 500 yards on an incline of 1 in 8, the speed being of course very great when it reached the bottom, On arriving there the buffers fairly met, and both wagons were in a few seconds lying a heap of splinters and fragments, wood and iron being alike smashed up. On examining the wreck, the lithofracture was found smeared on the buffer heads and other parts of the wagons, no explosion having of course occurred.

ICE SHAVING MACHINE.

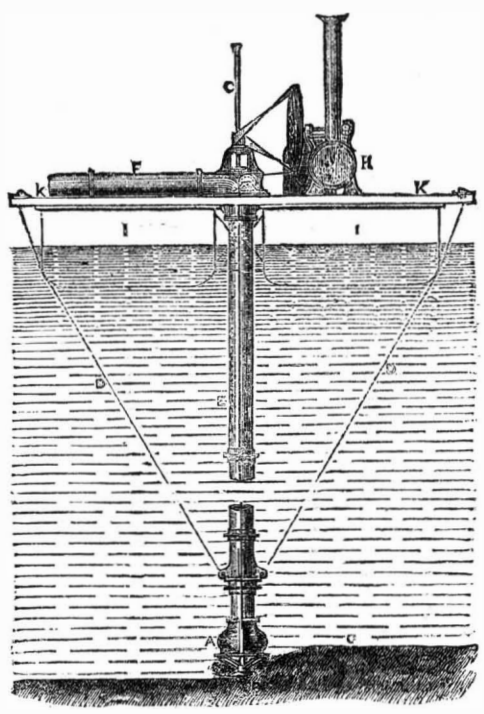
Our engraving illustrates an ice shearing machine for soda fountains, bars, etc. It is constructed on the principle of the carpenter's plane. The block of ice is moved upon the surface of a board, and its under side, meeting the edge



of the cutter, is pared away, the cuttings falling into a suitable receptacle, from which they are taken for use. The implement is the invention of Robt. Gilliland, of Hudson, Mich.

DREDGING AND EXCAVATING MACHINE.

The accompanying engraving illustrates a simple arrangement of machinery which has been adopted by the Lords of the Admiralty for use in Her Majesty's Dockyard, at Chatham, England. Its use is for making excavations under water in the construction of sea walls or harbor works, and for removing accumulations from docks, harbors, and rivers. Besides these purposes, it is available for raising sunken ships, or removing water, earth, sand, and gravel from foundations, cylinders, caissons, and similar structures.



In our engraving, A is a casing containing a revolving disk, which is faced with steel, and has a steel screw, B, affixed to the end of the revolving shaft. This screw loosens, stirs up, and agitates the materials, as shown by the bank of mud or earth, C. A vertical discharge pipe, E, up which the loosened material is carried, is stayed by the chains, D. The head, A, is raised and lowered by ropes worked from the deck, K, laid on the pontoons, I I, and on which the engine and boiler are placed. F is a continuation of the discharge pipe, E, and delivers the materials and water discharged by the excavator into barges. G is the vertical shaft of the revolving wheel, which slides through the driving pulley, the latter being secured by a sunken key to the shaft. H is a portable engine for driving the apparatus. This machine can be so modified that it can be used for separating and elevating small coals, ores, gravel, lime, grain, seed, and other similar substances, and at the same time it can be used for washing or freeing the substances from earthy or other impurities. To enable the machine to be readily raised or lowered, or the length of the vertical discharge pipe to be increased or diminished, a telescopic or sliding pipe is inserted in its length, regulated by chains from the top, thus affording facility for lowering the apparatus to and working it at any desired depth below the surface.

NEW EXPEDITIONS TO THE ARCTIC REGIONS.

A Swedish North Pole expedition, under the direction of Professor Nordenskiold, has sailed from Stockholm. It consists of the ships Gegegard, Captain J. W. von Otter, and Gladan, Captain P. M. von Krusenstjerna.

The U. S. expedition, authorized by Congress, under the auspices of Captain Hall, of Arctic fame, is nearly ready for a start and will shortly sail from New York. The vessel selected is the *Polaris*, and in the *Patriot*, of Washington where the ship was fitted out, we find the following particulars:

The steamer is about 400 tuns measurement, considerably larger than the Advance, in which Dr. Kane undertook his famous voyage, and about the same size as the Germania, which left Bremen two years age on an expedition to the Arctic Seas. She has been planked all over her sides with six inches of solid white oak timbers, and has throughout been nearly doubled in strength; her bows being almost a solid mass of timber, sheathed with iron, and terminating in a sharp iron prow with which to cut through the ice. Her engine, which was built some years ago at Messrs. Neafie & Levy's works, in Philadelphia, is exceedingly powerful and compact, taking up but comparatively little space, and being peculiarly adapted for hard and severe work; and the propeller is arranged in such a manner, that it can be unshipped and lifted up on deck, through a shaft or "propeller well" in the stern, which is a great advantage when the vessel is under sail or surrounded by floating ice that might easily damage the blades. And, even in the worst case, a supply of extra blades has been provided, so that if one should by accident be broken, it can always be replaced. There is also an extra rudder on board, and several suits of sails and sets of spars of all dimensions. Of the two boilers, one is supplied with an apparatus to use whale oil for the generation of steam, as this will, in all probability, have to be relied upon when other fuel gives out, not only to furnish the propelling power, but also to heat up the vessel throughout by steam, which will, of course, be necessary as soon as the cold and wintry regions have been reached.

Steam will merely be used as an auxiliary, as the *Polaris* is rigged as a foretopsail schooner, and is fully able to sail and steer under canvas only. A novel and interesting feature in her construction is a new sort of life preserving buoy, which is placed on the outside of the vessel, in the stern, and can be lowered into the water, by touching a spring which is placed near the pilot-house. By touching another spring, an electric light, which is fixed upon the buoy about two feet above water, is ignited by completing the circuit of an electric current from a galvanic battery on board; and no matter how dark the night, or how obscure the arctic winter, the buoy can always be distinctly seen, and the man who has fallen overboard will know in what direction to swim for hope and help. Another excellent and peculiar part of her outfit is a canvas boat, the invention of Mr. John Hegeman, of Saratoga county, N. Y., by whom it has been patented, and from which Capt. Hall expects great results. As yet but one of these boats has been received, but another and smaller one will be added before the vessel leaves New York. The boat that we saw is 20 feet long, four feet wide and two deep, has a carrying capacity of four tuns, weighs only 250 pounds and can carry with perfect ease and safety 20 men. It consists of an interior frame, built of hickory and ash woods, over which is stretched a canvas cover that has been previously soaked in a preparation to render it perfectly water proof; and the whole boat can be taken apart and folded together in a space less than one eighth of its original size, in about three minutes, and by the assistance of a couple of men only. When folded up it is perfectly flat, and can be transported on a sledge across the ice without the least difficulty. When open water is reached the order of things is exactly reversed—the boat is unpacked and spread out, and the sledge and its contents taken on board, dog team and all.

As to those who are going to be the principals in this adventurous and dangerous expedition, they are all told, 29 men. There is not a man among them whose qualities and character have not been well tested, from the captain down to the cook. The leader and commander in chief is of course Capt. Hall; next in the command comes Capt. S. O. Buddington, of New London, an old whaling master of 30 years' experience, 21 of which were spent in the Davis Strait and Baffin's Bay. He is an old and trusted friend of Capt. Hall, who has implicit faith in his long experience and acknowledged ability. The second officer is Mr. H. C. Chester, also a whaling man, of 12 years' experience among the ice; and the third officer is Mr. William Morton, who was Dr. Kane's trusted friend and companion, and is the only living mortal to whom it was ever permitted to look upon the open Polar Sea. He had the sad privilege to accompany Dr. Kane to Havana, and to bring his remains from there to Philadelphia for interment. Mr. Emil Schumann occupies the post of first engineer, and the scientific corps will consist of three gentlemen, one of whom, Dr. Emil Bissells of Heidelberg, Germany, will attend the expedition as a surgeon naturalist. A student from the observatory at Ann Arbor, Mich., will probably be the astronomer; and an officer of the Signal Service Department will be aboard in the capacity of meteorologist Beside these, there will be a blacksmith, carpenter, steward, and 14 sailors, besides the Esquimaux interpreter, Joe, and his wife, Hannah. This latter interesting couple, with their little daughter, are genuine specimens of the Esquimaux, but having been in constant company with Capt. Hall for eight years past, they speak very good English, and have ac-

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quired civilized manners. Joe is a famous hunter and "sealer," and his little wife is quite an accomplished woman in a "small" way, with considerable talent for languages and for music. Their little daughter, who will accompany them, is five years old, and has been for some time at school in Connecticut, where her parents have been lately residing, the guests of Capt. Buddington. They will join the ship at the Brooklyn Navy Yard, and a nice cosy little cabin has been fitted up for the exclusive use of them and their child. They are glad to visit once more their native fields of snow and ice; and it is not at all certain that they will again return with the expedition.

Although Capt. Hall expects to accomplish his purpose of penetrating into the great Polar Basin, if such an one really exists, and visiting the North Pole, in less than three years, the Polaris has been provisioned for four years, which can be extended to six with a little economy and judicious distribution of rations. The great staple of provisions is the so-called "pemmican," which is composed of three parts of selected dried meat to one part of the best suet, mixed with some other ingredients. The food is both nourishing and wholesome, and there is no danger of scurvy,through the absence of salt—that pestilence of Arctic travelers—to be feared from its use. It is packed in 45 pound tin cans, hermetically sealed, and of this there is no less than 10,000 pounds stowed away in the hold, the manufacture of which consumed and condensed 23,000 pounds of ordinary beef and 5,000 pounds of suet. Besides this, there is any quantity of dried and dessicated vegetables, such as potatoes, tomatoes, onions, etc., and a large stock of flour, biscuits, sugar, coffee, tea, condensed milk, canned fruits, and all other necessaries for a protracted voyage. Capt. Hall, however, expects to be able to economize these provisions to a very considerable extent by substituting in their place the meat of the reindeer, musk ox, walrus, and other game of the regions he is about to explore. Everything has been done to make the quarters of both crew and officers as comfortable as the rather limited space would permit; and the between decks and cabins are perfect models of cleanliness. The state rooms, for the officers and scientist, are plain, but gotten up in good and convenient style, and the cabin aft is a perfect drawing room in in miniature. Handsome chromos decorate the walls, and a fine cabinet organ, a present to Capt. Hall from the Smith American Organ Manufacturing Company of Boston, promises cheer during the long arctic night. A handsome carpet covers the floor, and there is an air of calm comfort about this little room

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

Paine's Electro-magnetic Motor.

MESSRS. EDITORS:—Some years since, I made the discovery that when hydrogen gas was treated by simple contact with turpentine, it was rendered highly luminous without any perceptible waste of tne turpentine. The gentleman occupying the position of scientific editor in your office, at the time, in noticing my announcement of the discovery, among other complimentary remarks was pleased to say that if he had made such a statement "he would hide his head under a toadstool." So absurd did my statement seem, that, although it wasbacked by the testimony of some of the best chemists living, your scientist was at a loss for words to express his contempt for myself, and pity for the infatuated persons who endorsed my experiment. And yet, this unbeliever, in less than a month after his adverse criticism, published a full vindication of my discovery, from the pen of George Mathiat, United States Metallurgist, and also gave it his personal endorsement.

In your journal of June 10, you are pleased, in noticing my electro-motor, to introduce again the "toadstool" argument; and, allow me to assure you, with the same results. If you are acquainted with the gentlemen who are associated with me in this enterprise, you will know that they are men fully competent to judge of the facts in the premises, and men that you or I cannot mislead.

The engine you refer to has been in constant operation for eight months, running nine hours per day, doing a duty of 67,000 foot pounds, at an expense of three ounces zinc per day, of nine hours. The engine for four months was open to public inspection, no one being restricted from examining the same. On the formation of the company you allude to, it was deemed necessary to the interests of the same that the engine be withdrawn from general exhibition.

As regards the statements of what is to be done by the 4th July, a low me to remark that I propose to achieve a success even beyond that which you burlesque; but the question of date is an open one.

And now, having had my fling back, permit me to say that for thirty years I have been a practical experimentalist in electro-dynamics, that I am familiar with the experiments of Grove, Carpenter, Mayer, Faraday, Liebig, and a host of others, relative to the doctrines of correlation and conservation of forces. Therefore, I am no tyro, but the peer of any authority you may quote: and as such I unqualifiedly assert that instead of the miserably small result of 67,000 foot pounds, at a cost of three grains of zinc, we should realize 67,000,000 foot pounds.

The forces developed by the action of a single Bunsen quart cell, if utilized, and converted into power, would drive the largest ship afloat with a velocity only limited by the strength of the ship's frame; and you and I will live to see the day. if our lives are lengthened to the usual term, when this statement will be verified, and that, too, without involving the question of perpetual motion.

I propose, with your permission, in a future paper, to dispose thoroughly and effectually of all the learned disquisitions, which have suddenly occupied the scientific journals, going to disprove the practicability of electricity as a motive power. To do so, I shall not require any of Paine's theories or engines, the only illustrative objects being the common electro-magnet and the Bunsen cell.

Newark, N. J. H. M. PAINE.

Potato Diggers Again.

MESSRS, EDITORS:—Since the publication of the article entitled "Potato Diggers a Failure," I have looked in vain for a denial, but as the glove is not taken up, I must maintain the heading.

I would say to J. H. M. (in May 27th), that he is asking entirely too much when he calls for a machine to "detach them from the vines, weeds, stones, and dirt, and deposit them in a proper receptacle." Let us examine the operations in detail.

The vines must be pulled from the potatoes, leaving them in the ground, or separated after both have been raised. To clamp the vines by machinery, and lift quickly, would lift many hills entire, and pull the tops off others, leaving stubs of vines on the potatoes; but as vines fall in all directions, no machinery can pick them up so as to pull them. To separate the vines from the potatoes by machinery, after the hill is loosened or dug, is still more difficult.

Man power is not sufficient to drive a potato digger; therefore the machine must go by horses; consequently, it will move at the usual rate of horse machines, and must lift from one to three bushels of potatoes, and from twenty-five to one hundred bushels of dirt per minute. To do this, and deposit its contents in the rear of the machine, I think is possible; but to separate potatoes from vines, weeds, stones, and lumps of dirt, ready for bagging, is not. Many vines will hang, lumps of dirt and stone will mix and be so near in size and weight that no machinery can separate them. J. H. M. asks for "a machine that will uproot each hill separately, and detach them from the vines, weeds, stones, and dirt, and deposit them in a proper receptacle;" and thinks it could be done, if the field were planted regularly. Allowing the hills to be all of equal distance apart, a machine so made as to dip or scoop up each hill separately, leaving the spaces between them, must be worked by an operator on the machine or automatically.

If J. H. M. thinks he can work a machine that must be moved as often as once in an average of two feet, at the rate of a team's pace, let him try it. I have done so, and find it very difficult to do. But I presume he would have it worked automatically, and will adjust it at the end of the row; but he will soon find that the unevenness of the ground and the crooked driving will make it strike in the space or center of the hill, as the machine happens to gain or lose. Again, no point or shovel blade, large enough to take up a hill of potatoes, can be repeatedly pushed into the soft ground covered with weeds and vines, as the average potato field is. Its point soon becomes loaded with vines and weeds.

Although the required points mentioned by J. H. M. are all desirable, I think he should be contented if he could find a machine that can be driven over the field like a mower. He can then go on and pick up his potatoes, even if he has to separate them from the vines and stones, and if he gets them all without having them cut, bruised, or peeled by the machine. he should be satisfied. H. B. NORTON.

Traction Engine.

MESSRS. EDITORS:—A communication headed "Traction Engines," in the SCIENTIFIC AMERICAN of April 29, 1871, replied to by E. McKenzie, May 27, 1871, may make a word from the inventor, of the road steamer, G. H. Craft, of interest, as evidently one of the parties is incorrect in his views.

In practice, the steamer after passing an obstruction such as a brick or stone is elevated to correspond with the hight of this obstruction; and after passing over it with the wheels, rather than falling (as would ordinary wheels), if it did not go forward, it would be suspended upon the pushing legs standing at an angle of forty-five degrees; consequently, without power from the engine, it is eased forwards and down to correspond with the angles at which the pushing legs are set, the pushing legs of each set being balanced against each other, hence the machine cannot go backwards without raising the legs.

Our practical tests exhibit a most gratifying amount of traction power in proportion to the weight of machine; and should our larger machines come up to our expectations, we believe we will be enabled to use a total weight of machine to the amount only of 3,500 pounds to get full traction power, or the use of two cylinders six by ten, carrying 135 pounds of steam, making 250 revolutions and a plow speed of three miles per hour; or a power of steamer twenty horse, weight one and three quarter tuns. It will be but a short time before we shall have these questions definitely solved.

Our enterprise seems to move slowly, but to make personally twenty-seven complicated and intricate models in the period of two years and a half, and to attend the patent business connected therewith, to attend to the farm of 127 acres with 4,500 fruit trees, and still have time to read the SCIENTIFIC once a week, makes me look forward with more than ordinary interest to the coming time when I can cultivate more than a mere speaking acquaintance with my family.

New Albany, Ind. M. N. L.

Steam on the Erie Canal.

MESSRS EDITORS:—I wrote you a few days ago on the subject of canal (steam) navigation. Since then, I have seen your issue of the 3d inst. in which you treat of the numerous experiments with steam apparatus. This city, being so much interested in canal navigation, cannot say a word in favor of enlarging the canal, or in fact doing anything to facilitate or improve its navigation, without bringing down the denunciations of Chicago, Montreal, and other rivals.

You speak of the swell or wave, created by side wheels or screws, when applied to canal steamers. Now it is a truth that a stern screw, placed in a canal boat, does not create a swell or wave; the wave proceeds from the bow, never from the stern; there is there a sort of under-tow. This is a fact, as proved in numerous experiments made by Erastus Prosser, David Bell, and Seymour & Wells, of this city, who jointly built perhaps ten first-class steamers during 1858, 1859, and 1860, and gave them a fair trial.

They failed because the machinery took so much from the carrying capacity of the boats, which were of bluff models. With sharper models, of course more would have been taken from the carrying capacity. The only remedy for all this would be greater length and breadth.

Is it not idle to talk of improved machinery? What is better than the stern screws? Are not millions of money invested in ocean steamers driven by screws placed in the sterns of vessels? Now, if there were any better plan of propulsion, would not these people adopt it? and are not all mechanical engineers everywhere doing their best to invent improved methods? This thing of "invention" comes, as it were, accidentally. Ages may pass and nothing better than we have, be found out. In the meantime, we should not stop and wait for the new invention, but take the best we have now.

Another idea: If we had 600 ton canal steamers, we could profitably voyage from the lakes to the Chesapeake, and then through the Dismal Swamp canal to Wilmington, N. C.; and with a few comparatively inexpensive internal improvements, along into the St. John's river of Florida, and up it to the extremity of the peninsula, a navigation extending from lat. 26° to lat. 43° on the lakes, all inland.

Buffalo, N. Y. FORWARDER.

H. G. as a Steam Plowman.

MESSRS EDITORS:—A few days since I was at Magnolia Plantation, about forty miles below the city of New Orleans, when I saw the old philosopher, Horace Greeley, riding on one of John Fowler & Co.'s English steam plows, guiding and driving the plow, the shares being *twenty-six inches deep* in the soil. It was working as easily as a small two horse plow in light land; and plenty of pocket measures were used by the lookers-on, to verify the measurement. The soil was stiffer and harder to work than any land south of Mason and Dixon's line. Then I saw the old man get on and drive the cultivator, which was drawing seven lines about thirty inches deep, breaking up the ground between the cane rows

The "old man eloquent" can now go home, and in his paper, and in the new edition of "What I know about Farming" which he will issue, he can tell his readers what he knows and saw about steam plowing in Louisiana.

I have read much, in all the scientific and agricultural papers for the past ten years, about what farmers require; and the need is stated to be a small, light, cheap steam engine, that will go over the ground, and break up and cultivate the soil to a depth of from twelve to twenty-four inches. Have you scientific northern men little machines which you can fasten on a plow? You can calculate to a fraction the resistance, and how much power will be required to work stiff land two feet deep. Will you tell the agricultural world if a man or men can make a steam traction engine to plow two feet deep, and drag the plow behind it, and whether it is practicable or not? I think it is as easy to make it as to find the philosopher's stone.

You, Messrs. Editors of the foremost mechanical and scientific journal, the honorable Commissioner of Agriculture Capron, and a few of your foremost practical farmers and journalists, should come to the State fair in Louisiana, in the fall of this year, and see the practical daily working of two or three large English steam plows, near this city. I have not the least doubt that they can be greatly improved upon. But dispel the idea that small cheap steam engines can ever be made to do fabulous amounts of work, digging, breaking up, and plowing ground two feet deep, and dragging the plows behind them.

The time has arrived when the great prairies of the country and all the large farms must be worked by steam machinery. Get your inventors and farmers on the right track, and before ten years have passed, there will be thousands upon thousands of steam plows in use all over this great country. *Brains* are wanted at this time.

Brashear City, La. SPEED THE PLOW.

American Improvements wanted in the West Indies.

MESSRS. EDITORS:—We are anxious to introduce into our industrial schools, and among our small settlers, some inexpensive hand power machinery; and would be glad to obtain some information about a good washing machine, cider mill and press, seed huller, grinder and oil press, fiber-cleaning machine, coir cleaner, improved rotary pump, and the United States brick-making machine.

A descriptive catalogue with prices might help us in determining what is best calculated to suit, and what might be profitably sent to this market. JNO WOOD,

Kingston, Jamaica. First Asst. Inspector of Schools.

To clean silver door plates, use a weak solution of ammonia in water, applied with a wet rag. This wash is equally useful for silver plate and jewelry.

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ADDRESS OF PROFESSOR MORSE, AT THE CEREMONY OF UNVEILING THE STATUE IN CENTRAL PARK, NEW YORK.

FRIENDS AND CHILDREN OF THE TELEGRAPH: When I was solicited to be present this evening, in compliance with the wishes of those who, with such zeal and success, responded to the suggestion of one of your number that a commemorative statue should be erected in our unrivalled Park, and which has this day been placed in position and unveiled, I hesitated to comply, not that I did not feel a wish in person to return to you my heartfelt thanks for this unique proof of your personal regard, but truly from a fear that I could use no terms which would adequately express my appreciation of your kindness. Whatever I may say must fall short of expressing the grateful feelings, or conflicting emotions, which agitate me on an occasion so unexampled in the history of inventions. Gladly would I have shrunk from this public demonstration, were it not that my absence tonight, under the circumstances, might be construed into an apathy which I do not feel, and which your overpowering kindness would justly rebuke.

But where shall thanks begin, if, looking through all intervening instrumentalities, the Great Author of the gift of the telegraph to the world be not first of all acknowledged? "Not unto us, not unto us, but unto God be all the glory." When I consider that He who rules supreme over the ways and destinies of man, often makes use of the feeblest instruments to accomplish His benevolent purposes to man, as if, by grandest contrast, to point the mind with more marked effect to Him as their author, I cheerfully take my place on the lowest seat of His footstool. It is His pleasure, however, to work by human instrumentality. You have chosen to impersonate, in the statue this day erected, the invention rather than the inventor, and it is of no small significance that, in the attitude so well chosen and so admirably executed by the talented young sculptor whose work presents him so prominently and so favorably before you, he has given permanence to that pregnant and just sentence which was the first public utterance of the telegraph: "What hath God wrought!" Little did that young friend, 27 years ago, (and whose presence here to-night I most cordially greet,) in the artless innocence of a devout heart, dream of the far-reaching effect of that first telegram which she indited, upon him who transmitted it. While, as if by inspiration, she struck the key-note of the invention, placing its real Author upon the throne, it at the same time struck a responding chord within this bosom which still vibrates to temper, with its ringing note, any proud aspiration of a selfishness that, unchecked, might be disposed to exclaim: "Is not this great Babylon which I have built by the might of my power?" Yes, little did that young friend dream that she had thus furnished me a substantial retreat from the conflicting elements, which public and private praise at home, and the gratulations of foreign nations, stir into activity in the human heart unless is kept in just prominence the Supreme Author of the gift.

You have chosen to impersonate in my humble effigy an invention which, cradled upon the ocean, had its birth in an American ship. It was nursed and cherished not so much from personal as from patriotic pride. Forecasting its future, even at its birth, my most powerful stimulus to perseverance through all the perils and trials of its early days—and they are neither few nor insignificant—was the thought that it must inevitably be world-wide in its application, and, moreover, that it would everywhere be hailed as a great American gift to the nations. It is in this aspect of the present occasion that I look upon your proceeding as intended, not so much as homage to an individual as to the invention "whose lines" from America "have gone out through all the earth, and their words to the end of the world." In the carrying out of any plan of improvement, however grand or feasible, no single individual could possibly accomplish it without the aid of others. We are none of us so powerful that we can dispense with the assistance, in various departments of the work, of those whose experience and knowledge must supply the needed aid of their expertness. It is not sufficient that a brilliant project be proposed, that the modes of accomplishment are foreseen and properly devised; there are, in every part of the enterprise, other minds, and other agencies to be consulted for information and counsel to perfect the whole plan. The Chief Justice, in delivering the decision of the Supreme Court, says: "it can make no difference whether he" (the inventor) "derives his information from books or from conversation with men skilled in the science,"—and "the fact that Morse sought and obtained the necessary information and counsel from the best sources, and acted upon it, neither impairs his rights as an inventor nor detracts from his merits."

The inventor must seek and employ the skilled mechanician in his workshop to put the invention into practical form, and for this purpose some pecuniary means are required, as well as mechanical skill. Both these were at hand. Alfred Vail, of Morristown, N. J., with his father and brother, came to the help of the unclothed infant, and with their funds and mechanical skill put it into a condition creditably to appear before the Congress of the nation. To these New Jersey friends is due the first important aid in the progress of the invention. Aided, also by the talent and scientific skill of Professor Gale, my esteemed colleague in the University, the telegraph appeared in Washington in 1838, a suppliant for the means to demonstrate its power. To the Hon F. O. J. Smith, then Chairman of the House Committee of Commerce, belongs the credit of a just appreciation of the new invention, and of a zealous advocacy of an experimental essay, and of the inditing of an admirably written report in its favor, signed by every member of the committee. It was nevertheless thrown aside among the unfinished business of the session; and now commenced days of trial. Years of delay were yet before it. It was not till 1842 that it was again submitted to Congress. Ferris, and Kennedy, and Winthrop, and Aycrigg, McClay, and Wood, and many others in the House, far-seeing statesmen, rallied to its support, and at length, by a bare majority, the bill that was necessary was carried through the ordinary forms, and sent to the Senate, where it met with no opposition, and was passed the last night of the session.

Now commenced a new series of trials, to which it is unnecessary here to more than allude. To Ezra Cornell, whose noble benefactions to his State and the country have placed his name by the side of Cooper and Peabody, high on the roll of public benefactors, is due the credit of early and effective aid in the superintendence and erection of the first public line of telegraph ever established. Notwithstanding the success of the experimental essay, another important step was necessary ere the invention could demonstrate its vast utility. It was not until the skill and experience of the best Postmaster General that ever held that office, the Hon. Amos Kendall, were brought into requisition, that, amid many discouragements, the various companies were organized, and in the hands of such enterprising men as Sibley, who united the Atlantic and Pacific, and Swain, and Wade, and a host of determined men whose names would read like the pages of a dictionary, this vast country, from the northern boundaries of Canada to the Gulf of Mexico, and from the shores of the Atlantic to the Pacific, was webbed with telegraphic wires.

Another grand stride was yet to be taken ere international communication could be established. In October, 1842, the first submarine telegraph cable was laid by me in one moonlight night, in the harbor of this city, which proved experimentally the practicability of submarine telegraphy, and from the result of this success I ventured, the year after, in a letter to the Secretary of the Treasury, to predict the certainty of the Atlantic Telegraph. It was then believed to be a visionary dream; and had the individual carrying out of so bold an enterprise depended upon me alone, it might still have been a dream. But at this crisis another mind was touched with the necessary enthusiasm, admirably fitted in every particular, by indomitable energy and perseverance and foresight, as well as financial skill and influence, to undertake the novel attempt. To Cyrus W. Field, more than to any other individual, belongs the honor of carrying to completion this great undertaking. Associating with himself Cooper, and Taylor, and Roberts, and White, and Hunt, and Dudley Field, and others on this side the Atlantic, and, two years later, Peabody, and Brett, and Brooking, and Lampson, and Gurney, and Morgan and others in Great Britain, making the ocean but an insignificant ferry by his repeated crossings, undaunted by temporary failures and unforeseen accidents, he rested not till Britain and America were united in telegraphic bonds—the Old and the New World in instantaneous communication.

If modern progress in the arts and sciences has given unprecedented facilities for the diffusion of the telegraph throughout the world, back of all are the former discoveries and inventions of the scientific minds of Europe and America—Volta, Oersted, Arago, Schweigger, Gauss and Weber, Steinheil, Faraday, Daniell, and Grove, and a host of brilliant minds in Europe, with Professors Dana and Henry in our own country, in the past, and the more modern discoveries and inventions of Thompson, of Whitehouse, of Cooke, of Varley, of Glass, and Canning, and numerous others. These all, in a greater or less degree, contributed to the grand result. There is not a name I have mentioned, and there are many whom I have not mentioned, whose career in science or experience in mechanical and engineering and nautical tactics, or in financial practice, might not be the theme of volumes, rather than of brief mention in an ephemeral address.

Tonight you have before you a sublime proof of the grand progress of the telegraph, in its march round the globe. It is but a few days since that our veritable antipodes became telegraphically united to us. We can speak to and receive an answer in a few seconds of time from Hong Kong, in China, where ten o'clock tonight here is ten o'clock in the day there, and it is perhaps a debatable question whether their ten o'clock is ten today or ten tomorrow. China and New York are in interlocutory communication. We know the fact, but can imagination realize the fact? But I must not further trespass on your patience at this late hour.

I cannot close without the expression of my cordial thanks to my long known, long tried, and honored friend Reid, whose unwearied labors early contributed so effectively to the establishment of telegraph lines, and who in a special manner, as chairman of your memorial fund, has so faithfully and successfully and admirably carried to completion your flattering design. To the eminent governors of this State and the State of Massachusetts, who have given to this demonstration their honored presence; to my excellent friend, the distinguished orator of the day; to the mayor and city authorities of New York; to the Park Commissioner; to the officers and managers of the various. and even rival, telegraph companies, who have so cordially united on this occasion; to the numerous citizens, ladies and gentlemen; and, though last, not least, to every one of my large and increasing family of telegraph children. who have honored me with the proud title of "Father," I tender my cordial thanks.

IMPROVEMENT OF THE MISSOURI RIVER AT ST. JOSEPH, MO.

A preliminary survey of the Missouri river, in the vicinity of St. Joseph, with a view to determine the practicability of constructing a bridge with a draw, and of protecting the banks from the action of the current, and controling the direction of the channel, in such a way as to secure a constant steamboat channel along the levee, in front of the city, has been made by Mr. E. D. Mason, C. E., whose report contains some interesting information relative to the character of the river at this point. As a navigable river, the Missouri is one of very great importance, affording an outlet for the products of an immense area of great fertility, and rich in mineral wealth. Such a work as this survey anticipates is of more than local importance, and we therefore give place to some facts concerning it.

The area drained by the river is over a half million square miles, and four fifths of the water collected from this water shed passes St. Joseph. The average annual rainfall, on that part of the basin drained by the river above the city, is nineteen and a half inches; but six tenths of this water passes during the months of June and July. The river is, therefore, during these months, a swollen, rapid torrent, making havoc in its banks, cutting out new channels and filling up old ones, and, it is needless to say, so changing its channels that, in the subsequent low water, navigation is interfered with, and the approach of steamboats to the levee is difficult. Mr. Mason states that, during an ordinary spring flood, 170,000 cubic feet of water pass per second, with a velocity of three and eight tenths miles per hour, while, at low water the mean flow is reduced to 18,000 cubic feet per second, and the velocity to two and six tenths miles per hour.

The following extract from the report will serve to exhibit better the necessary results of this enormous difference in flow, and the engineering difficulties to be overcome in the proposed improvements:

A survey was made of the river, from the rock bluffs near Belmont, extending seven miles, to a point below the city, and its low and high water channels carefully examined. The fall in the low water channel, for that distance, was found to be uniformly 82-100 of a foot per mile. This channel is very tortuous, crossing the bed of the high water channel four times within the space surveyed. The axis of the current at high water is much shorter than at low water, and has a fall of over one foot per mile. Although the mean velocity is as stated above, there are threads of the current which probably flow with nearly double that speed, at both high and low water. At low water, the channel opposite the city is from 400 to 500 feet wide, and from fifteen to thirty feet deep The difference of level between extreme high and low water is found to be twenty-three feet. At the greatest flood, the narrowest channel opposite the city will be 1,420 feet wide. Rock is found at an average depth of forty-three feet below low water, and at no point deeper than forty-eight feet. The bed of the river is fine sand on top, with layers of clay or mud and coarser sand nearer the bed rock. The Missouri shore, in the vicinity of the hereinafter proposed bridge site, is composed of tough clay, or "gumbo," having considerable power to resist the action of running water. Its line has changed comparatively little within the memory of the oldest settlers. The Kansas shore is alluvium, in alternate layers of fine salt and silt, of small specific gravity, and very easily moved by an impinging current. The sand in the bed of the river is almost as easily moved by running water as is the material composing the Kansas shore; and trifling obstructions to the current are sometimes the beginning of important changes in the direction and depth of the channel, making a rapid river with its bottom but a few feet above the rock where a few days before was dry land at ordinary high water. With these facts in view, any bridge across the Missouri river at St. Joseph, to be considered permanent, must be built upon the hypothesis that the river is at flood the whole width, from bank to bank, its channel bed on the rock, and the current running at its swiftest speed.

In connection with the improvements designed to maintain a channel along the levee, the protection of the Kansas shore, to prevent the destruction of valuable arable lands, is considered. Mr. Mason thinks this might be accomplished by sloping the bank and covering it with rip-rap, constituting a paved levee the whole distance from St. Joseph to Wathena; but he thinks piers to deflect the current from the shore a better plan, as well as cheaper. These piers would not only protect the Kansas shore, but accomplish the desired end of throwing the current over and along the levee at St. Joseph, keeping the channel clear and open.

The proposed bridge will be 1,450 feet in length, having four fixed spans, each 260 feet in length, and a draw of two spans 225 feet each. Its estimated cost is $765,000.

SCIENTIFIC INTELLIGENCE.

QUANTITATIVE DETERMINATION OF IODINE.

William Reinige proposes a new method for the quantitative determination of iodine, founded upon the decomposition of the permanganate of potash by iodide of potassium. As neither chlorine nor bromine exhibits the same reaction, this method would appear to be the best for the quantitative analysis of iodine compounds. Take a solution of an iodine salt, add a little sulphuric acid to neutralize the excess of alkali, or render slightly alkaline by means of carbonate of potash or soda; then heat to gentle boiling in a beaker glass, and gradually add a solution, composed of 2·5 grammes permanganate of potash dissolved in 497·5 grammes distilled water, until all of the iodide of potassium is decomposed. The quantity of permanganate consumed will give the amount of iodine, for every gramme of it represents two milligrammes of iodine. The accuracy of the analysis is not destroyed by the presence of bromine or chlorine in the solutions.

A NEW GAS BURNER.

A new lamp, similar to a Bunsen burner, and called a forge lamp, has been introduced in London, by Delheid & Bergé. It consists of a candle burner, over which is put a tube as in the Bunsen burner, but with this difference, that the cylinder is larger and always ends below the opening of the gas jet, so that the air enters below the jet, and on all sides of it. As soon as the gas mixed with air is lighted at the top of the cylinder, a powerful draft is at once produced, giving the effect of a blowpipe flame. To obviate the flickering of the flame, an outer cylinder is soldered to the inner, in such a way that the air, before it reaches the inner tube, must pass through the outer. This serves the double purpose of keeping the apparatus cool and of heating the air before it mixes with the gas, by which the caloric effects are largely increased. The gas is entirely consumed, and the draft of air is said to be as great as if produced by a bellows. The heat is much greater than in an ordinary Bunsen burner, and the apparatus is remarkably simple.

SUITABLE MUCILAGE FOR PABCHMENT PAPER.

The difficulty of pasting edges of parchment paper together has seriously interfered with the employment of this material for many purposes. The enormous consumption of the celebrated pea sausage during the recent war in Europe, occasioned an unusual demand for suitable packing cases. As 100,000 sausages were manufactured daily, the supply of entrails was wholly inadequate to meet the demand, and many experiments were made with parchment paper, until Dr. Jacobsen succeeded in inventing a glue that would withstand hot water, and was entirely suited for the purpose of making watertight joints. One firm is reported to have made more than a million cases in the course of a few months, and as many as 150 workmen are kept constantly employed. Several layers of parchment paper are placed upon each other, and in this way imitation parchment is prepared for bookbinding. It is also probable that elastic gas tubing could be made of the same material, and that an extensive use would at once arise for paper bags impervious to moisture, and for wraps for all kinds of delicate goods. It would be well for some of our inventors to study up this subject.

IN recompense for the short duration of life entailed by some occupations, it must be regarded as a consoling, almost a sublime fact, that labor, in general, does not tend to shorten life, but rather, by strengthening the body, to lengthen it; while idleness and luxury are productive of the same results as the most unhealthy occupations.

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Improved Feed Cutter.

The combination of devices, shown in the annexed engraving, renders the machine illustrated a most efficient, as well as simple and durable, implement. We have seldom met with an agricultural machine which seemed, in all respects, more adapted to the purpose it was intended to subserve. The feed cutter is a machine that should be on every farm, and the inventor of the one we are about to describe has evidently comprehended the requirements of farmers in this respect. The feeding apparatus is one of the principal features of the invention. Its operation is as follows:

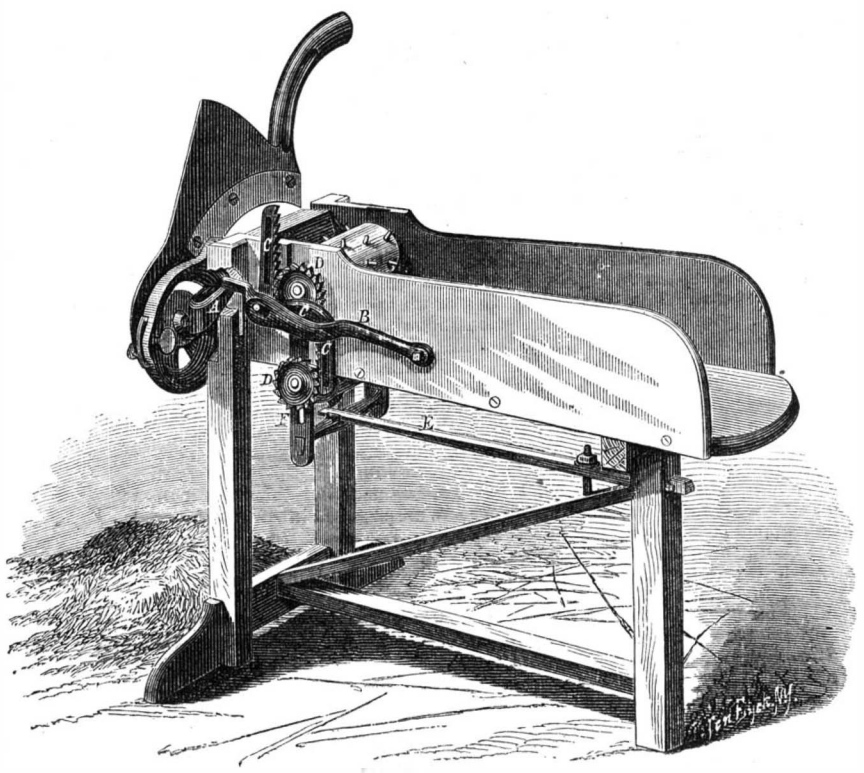
A lug, A, is attached to the knife plate. As this plate is actuated by the hand in cutting the forage, the lug lifts the end of a pivoted bar, B. To the bar, B, is pivoted a ratchet bar, C. This bar is bent at right angles and toothed, as shown, so that the teeth of one end engage the upp r ratchet wheel, D, and the lower teeth actuate the lower ratchet wheel. These wheels are respectively attached to the feed rolls. The effect of this arrangement is, that the operator can gage his feed exactly as he wants it while cutting, the amount of feed being regulated by, and depending upon, the motion of the knife plate. The higher the latter is lifted, the greater will be the feed, and *vice versâ*.

The upper feed roller is held down upon the hay or other material to be cut, by means of a wooden spring, E, which acts through a crosshead and vertical bars, F.

The feed rollers are furnished with suitable blades and points with which to grasp and carry forward the materials to be cut, and also to hold them firmly so that they will not be drawn out of place by the pressure of the cutting knife.

The cutter bar, at the point where it is pivoted to the fulcrum, is compressed between an armed washer of large size secured by a nut, and a friction compress tightened by a thumb screw, so as to force the knife always to move close to the face plate, allowing no chance for it to spring off from the substance to be cut.

The advantages gained, in addition to those already stated, are, a broad guide plate for the knife; the closeness with which the knife holds itself to the face plate; and the automatic feed arrangement, by which the danger and labor of feeding by the hand of the operator is avoided.



GARTH'S FEED CUTTER.

The machine is covered by two patents, obtained through the Scientific American Patent Agency, dated respectively Dec. 1, 1869, and Nov. 15, 1870. Address the patentee, G. S. Garth, for territorial rights and further information, at Mill Hall, Clinton Co., Pa. Pa., Md., and D. C., are not for sale.

RE-VACCINATION--GLYCERIN LYMPH.

The great prevalence of smallpox in Europe and this country, at the present time, has led to a re-examination of the statistics of vaccination. It has been found that no re-vaccinated person has been admitted into the London hospitals, a fact which speaks volumes in favor of the practice.

Another peculiarity is now recognized, and that is, that vaccination previous to the age of puberty cannot be relied upon as a protection afterward, and that therefore children should be re-vaccinated when they have passed the boundary between childhood and adult age.

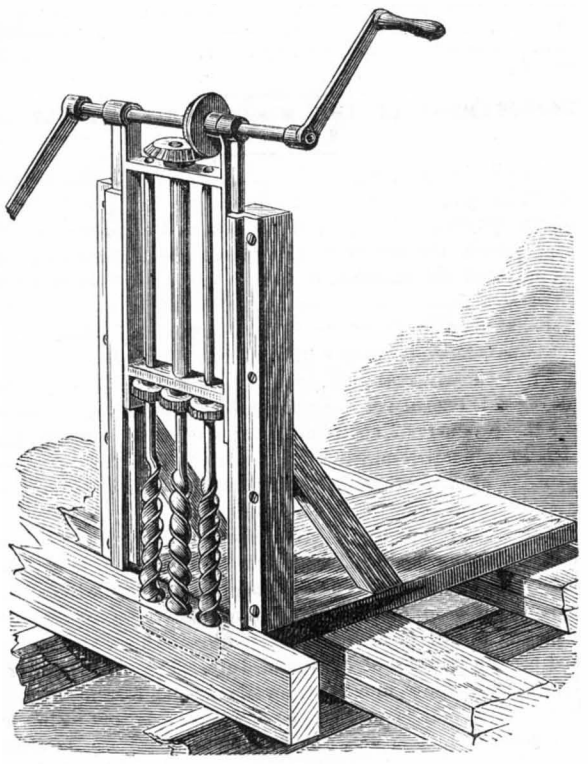
Prussia is avowedly the country where regular re-vaccination is most generally practised, the law making the precaution obligatory on every person, and the authorities conscientiously watching over its performance. As a natural result cases of small pox are very rare. It has, however been objected, there as here, that lymph is scarce. To make the most of such lymph as there is, Government has tried its application when mixed with glycerin, and the result was so successful as to lead to a public recommendation of the mixture to official vaccinating surgeons. The manner in which the glycerin lymph is prepared is thus described by the *Reichsanzeiger:* The pustules of a healthy vaccinated person are opened with a needle, and the effluent matter carefully removed by means of a lancet, the same instrument being gently applied to assist the efflux. The lymph is then best placed in the hollow of a watch glass, and there is mixed with twice its quantity of chemically pure glycerin and as much distilled water. The liquids are thoroughly well mixed with a paint brush. The mixture may be preserved for use in capillary tubes or small medicine glasses. The lymph thus procured is considered equal in effect to pure lymph; care must, however, be taken to shake it before use. As the same quantity that now suffices for one is thus made to suffice for five, the discovery ought to be extremely useful in crowded cities like ours.

Electrotypy---Imitation of Leather.

There is not a doubt but that this is an age of imitations; and the sham is so often taken for the real that even judges themselves have been misled. In manufactures there is such a constant demand for something new that the best energies are severely taxed to meet the requirements of the hour, and it is surprising to many how promptly this craving is satisfied. As an instance of the extending power of the imitator's art, we have noticed that Messrs. Elkington and Co., of Birmingham, have arranged to produce, by the electrotype process, imitations of the choicest grains of leather. They say that the system of producing leathers in exact facsimile of morocco, seal, and other skins, by means of electro deposited copper rollers, has now become an established branch of leather manufacture. The fine grain of the most rare and valuable skins can by this process be reproduced at a merely fractional cost, as compared with the ordinary inferior imitations. The system may be briefly described as follows: An ordinary machine roller is fitted with a mandrel, upon which is deposited, by a new process, the copper facsimile. The latter is an exact copy of any rare or choice skin required to be reproduced, and it is only by a recent improvement in electrotyping that the difficulty of depositing from such a substance as leather has been surmounted. An ordinary skin can thus be impressed with the beautiful surface of morocco skin, even to the finest variations of grain, and several thousand may be copied by one deposit. In all cases the actual skin required to be copied must be sent. These rollers are supplied ready for the machine; or, if preferred, manufacturers may send their own mandrels and have the facsimile deposited thereon.

BORING AND MORTISING MACHINE.

Our engraving is a good representation of a boring and mortising machine, invented by Arthur O'Neal, of Hyde Park, Mass. As will be seen, it is simply the adaptation of an old principle to driving a gang of augers instead of a single one. The power is first transmitted to the central auger, and from its shaft to the others by means of gearing, the two outside ones having their twist and cutting edges in the opposite direction from the middle one.



Tremendous Earthquake in China.

The neighborhood of Bathang, in the district of Sechuen, the central western province of China, has been devastated by one of the most appalling earthquakes of modern times. On April 4th, the earth trembled so much that houses and public buildings were thrown down and destroyed. Volcanic fire burst forth from fissures in the ground, and tempests of wind increased the destructive power of the flames. The subterranean thunder continued to be heard for three days, and the whole district was rocked like a vessel at sea. The disturbance lasted for ten days, after which the motion subsided. Besides large public buildings, a temple containing 350 rooms, and six smaller ones, as well as nearly 2,000 houses, were utterly broken in pieces. The deaths are known to amount to 2,393 people. The influence took a circular direction, and covered 400 miles of ground. Our readers will understand the effect of this visitation on such a people as the Chinese, whose superstition and credulity are proverbial.

THE GOVERNMENT OF NEW YORK CITY.

The rapidity of the growth of population and wealth in New York city naturally makes its inhabitants anxious that its administration be conducted in the best, wisest, and most economical manner. All Americans are proud of the Empire City, and we natives especially hope to see it the best governed city in the United States.

Of the importance of the city, and the magnitude of its interests, the annual message of the Mayor, just published, gives us opportunity for judging. The population is declared to be 942,252 souls, the amount of property, real and personal, valued for taxation is $1,075,000,000, and the taxes for the year, $23,300,000. The imports fromother countries amounted to over $300,000,000, and the customs duties collected to over $140,000,000. The exports from the port of New York were about $300,000,000. These are imposing figures, showing that the commercial interests of New York will alone suffice to place the United States high in the category of nations.

For the comfort and well being of its vast population, 460 miles of streets, 340 miles of water pipes, and 275 miles of sewers, have been constructed; 19,000 gas lamps have been erected; and nearly 1,300 cars and omnibuses, and 94,000 carriages, licensed and private, traverse the streets daily.

The area of New York city comprises about 22 square miles, with a frontage to the Hudson and East Rivers of 29 miles. Of the necessity for the reconstruction of the whole water frontage, we have spoken at length in a recent article, as well as of the plans under consideration, and the manner of carrying them out. In respect to public improvements generally, the Mayor states that the city could be liberally ornamented and beautified, as well as rendered more subservient to the public convenience, by an expenditure of $20,000,000 during the next three years. and that the increased value of property would lighten the pressure of taxation by better distribution of its incidence. The property belonging to the city is stated at $267,000,000, while the outstanding debt is only about $80,000,000. There is no wonder, then, that the savings banks and other monetary institutions in search of unquestionable investments, which are accustomed to prefer securities that are backed by real estate, invest largely in bonds of the City of New York.

The Marks from Small Pox.

The painful and malignant disease, which has lately, thanks to uncleanliness and the disregard of the most ordinary precautions for the preservation of health, made such a change in the bills of mortality in this country and in Europe, calls to mind several of the remedies which are reputed to have the virtue of preventing the disfiguration of the skin. Among others, the *Sarracenia purpurea* was introduced into England. This plant is familiar to the natives of South Carolina, and is used by them internally, in the form of infusion, or decoction, for the cure of the same disease. It is a tonic, slightly stimulating, and is useful in cases of dyspepsia, waterbrash, and abdominal distension. There is another, well known in India, the leaves of which are used by the natives to cover the bodies of sufferers for the above mentioned purpose. Dr. Wright says that "the leaves, beaten into a pulp and externally applied, act like a charm in removing the most intractable form of psora and other pustular eruptions." This plant is the *Melia Azadir-achta* of Linnæus, and is called *pride of India, pride of China,* or *bead tree.* It is found, also, in our Southern States. It is, when taken internally, cathartic, emetic, and a powerful vermifuge; but its use, as described by Dr. Wright, does not appear to be known in this country. We look with interest for the results of experiments with it for the purpose of lessening the terrors of small pox.

SINGER'S SEWING MACHINE IN ENGLAND.—Arrangements have been made for the extension on a large scale of the Singer Sewing Machine Company's manufactory in James street, Bridgeton. Building operations have already been commenced, and the additions contemplated will give about 25,000 square feet of extra floorage, thus affording employment to 300 additional hands. The new premises are expected to be finished and ready for occupation by August. The factory will then be capable of turning out fully 1,400 machines per week, being nearly double the present average production; while the total number of hands employed will be very little short of 1,000. These extensions will necessarily involve a large addition to the existing plant, and a lot of new machinery is about to be introduced for the medium or No. 1 machine. It is said that the Singer machine factory at Bridgeton is now the largest in the United Kingdom, and, in its enlarged form, it will compare favorably with some of the colossal establishments on the other side of the Atlantic. —*Engineering.*

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Contents:

(Illustrated articles are marked with an asterisk.)

Address of Professor Morse at the Ceremony of Unveiling the Statue 405
American Improvements, Wanted in the West Indies 404
Answers to Correspondents 408
Applications for the Extension of Patents 410
Blowing out of the Caisson of the East River Bridge 402
*Boring and Mortising Machine 406
Business and Personal 408
Close of another Volume 407
*Dredging and Excavating Machine 403
East River Bridge—Report of the Chief Engineer 408
Easy method of Cutting Glass 399
Electrical Shadows and Images 402
Electrotypy—Imitation of Leather 406
Extract of Meat 401
Flying Machine 407
*Flying Machine 402
Formation of gold nuggets 401
H.G. as a Steam Plowman 404
How many Hours Constitute a Day's Work? 401
*Ice Shaving Machine 403
*Improved Carriage Hub 399
*Improved Feed Cutter 406
Improvement of the Missouri river at St. Joseph, Mo 405
Index 410
Inventions Patented in England by Americans 408
Lithofracteur 403
Manufacture of Spring Knives 401
Milk Coolers 401
New Books and Publications 409
New Expeditions to the Arctic Regions 408
Official List of Patents 411
Paine's Electro-magnetic Motor 404, 407
Potato Diggers again 404
Preserving Stone from effects of Damp Air 400
Prolonged Vigils 401
Protoplasm again 401
Queries 409
Recent American and Foreign Patents 409
Recovering gold 399
Resources of the Northwest 402
Re-vaccination—Glycerin Lymph 406
*Revolving Blade Scroll Sawing Machine 399
Scientific Intelligence 405
Singer's Sewing Machine in England 406
Steam on the Erie Canal 404
Sunstroke 401
The Application of Steam to Canals, No. 3 400
The East River Bridge 407
The Government of New York City 406
The Inauguration of the Morse Statue 407
The last Six Months of Chemistry 407
The Marks from Small Pox 406
The Phenomena of Vibration 400
Traction Engine 404
Tremendous Earthquake in China 406
*Vagaries of the Patent Office 402
Whitewash for outside walls 408
Worcester Manufacturers 400

The present issue of the SCIENTIFIC AMERICAN closes the first volume of 1871.

Subscribers who commenced with the volume, and paid for half a year, are reminded that the time for which they prepaid will expire with this number. We hope every one of these six month subscribers will renew before the 1st of July.

The safest way to remit is by draft on New York, postal order, or check on some bank, although money is seldom lost when secured in letter and properly directed. Address MUNN & CO., Box 773, New York.

CLOSE OF ANOTHER VOLUME.

The present number completes the Twenty-fourth Volume of the New Series of the SCIENTIFIC AMERICAN.

As we write, our subscription list is larger than at any other period in the history of our popular journal, and it is still growing steadily and healthfully, without any special exertion on our part, except that always made to render our paper the best popular scientific publication in the world.

By comparing the index of the present volume with those of preceding volumes, it will be seen that a considerably greater variety of subjects has been discussed than in any other volume. We have labored earnestly to please and instruct our readers in the selection of topics as well as in their treatment, and we have every reason to believe we have succeeded.

The hearty friendship to our enterprise, evidenced in the warm praises received from our numerous correspondents, encourages us again to appeal to our readers for their cooperation in extending the usefulness of the SCIENTIFIC AMERICAN, by inducing others to subscribe for it. While our paper is, we believe, the best of its class, we know it to be the cheapest; and no man can invest money more profitably than in securing such a fund of practical and useful information as we annually furnish.

The departments of "Queries," and "Answers to Correspondents," is, under the present plan of conducting it, eliciting a large amount of practical information upon the whole range of industrial arts. We hope our correspondents will continue their favors and aid us in ultimately making this one of the most valuable features of our paper.

With these remarks we pass on to the next volume, pledging that our efforts shall be put forth unremittingly to maintain and increase the value of the SCIENTIFIC AMERICAN and to sustain its reputation.

THE LAST SIX MONTHS OF CHEMISTRY.

In turning over the leaves of our last volume, to see what has been done in the line of chemistry, we do not come across the record of any startling discoveries, but we find a very satisfactory condition of things in the various laboratories of the world, and there is abundant proof of unusual industry among scientific men. It is pleasant to see that the ranks of scientific laborers have not been so largely thinned by death as they were a year ago. Very few men of distinction have been summoned away during the last six months, and the biographical sketches of these few have found suitable place in our columns. Conspicuous among those who have closed their labors may be mentioned Professor Wetherill, William von Haidinger, and Professor Staedeler.

The efforts of chemists have been chiefly directed towards increasing our knowledge of the properties of substances previously discovered. This is in accordance with the humanitarian spirit of the age. The tendency now always is to make practical use of everything—in other words, to turn it to good account—and in this pursuit the chemists have been unusually successful since the commencement of the year. We can not occupy the time of our readers with a repetition of the accounts already given of the leading investigations, but it may be worth while to recall to mind a few improvements that have been made, in order to encourage original workers to make renewed exertions to round up and complete certain desired inventions.

A cheap method of making hydrogen was suggested by Du Motay, the same chemist who has enriched our knowledge of the manufacture of oxygen, which consists in heating slaked lime with some carbonaceous material. It looks like a cheap and easy way of procuring a gas that would have extensive application in the arts, if it were available in unlimited quantity. When we have hydrogen in abundance, we can easily carburet it, and it would be a singular thing indeed if some day our illuminating gas were to be made out of water combined with slaked lime, and the distillation of coal were to be confined to the production of tar derivatives and aniline colors.

Our knowledge of hydrate of chloral has been much extended. A good deal of contradictory testimony exists in reference to it, and we are now going through the doubtful stage, in which the skeptical refuse to believe, and the credulous are much disturbed in mind. We have taken pains to give both sides a fair hearing, and the summing up of the evidence lead us to think that as a hypnotic the hydrate of chloral is one of our most useful remedies; but it ought never to be applied without the knowledge and consent of the best medical authority. The employment of chloral as a reducing agent, in many chemical processes, is novel, and bids fair to become a very important one. The incidental products growing out of its manufacture on a large scale, have also found an use in the dye vat, so that our knowledge of this subject has decidedly increased during the past six months.

The increasing demand for albumen has occasioned more than the usual activity in the search for new sources of supply. While merchantmen look to far off islands, frequented by wild birds, the chemist examines home products, and finds in the blood a supply of albumen, that ought to be better economized and more largely used than it has hitherto been. Blood albumen is becoming a large article of manufacture, and some specimens we have seen are but little inferior to the best product of the egg. The sugar refiner, the photographer, the calico and aniline printer, consume large quantities, hence the attention bestowed upon this branch of industrial chemistry.

Beet sugar and grape sugar, two industries of the first importance, have received extraordinary attention of late, and they are likely to develop into sources of wealth to those who enter upon them with adequate knowledge and proper caution. In a country where corn is grown in such enormous quantity as on the prairies of the West, grape sugar made from starch ought to become an article of export. Its uses in the arts have increased wonderfully, and the demand for it is likely to advance just in proportion as a popular knowledge of its value is further disseminated. Beet sugar is undergoing experimental examination, as we have shown, and bids fair to assume importance in this country as well as in Europe.

The artificial production of cold by chemical means has been considerably studied, and we have published all that has been made known on the subject. The most successful agent thus far appears to be ammonia, and it is peculiarly fortunate that this chemical product can now be obtained very cheaply and in large quantities. Ammonia, as a motive power and as a refrigerating agent can justly claim the attention of all experts. It is only a few years since the first organic compound was made by artificial means. The announcement of the discovery was everywhere greeted with profound attention, as the thought was near that at some future time we should be able by synthesis to make such rare and valuable medicines as quinine, morphine, codeine, and narcotine. Within a few months we have been able to give an account of the artificial production of coniine, one of the alkaloids, and this discovery offers encouragement that we are making progress towards the grand result indicated above.

The use of chlorine gas in metallurgical operations, although suggested some years since, has recently been brought more prominently before the public in connection with the toughening and refining of gold. As the production of chlorine gas can now be economically accomplished on a large scale, more particularly by Deacon's process, the attention of chemists is more than ever directed towards it, and there appears to be little doubt that it will obtain extensive use in the separation of many metals. The rare elements, silicon and aluminum, are more readily obtained from chlorine compounds than in any other way, and it is probable that gold will hereafter be refined by the use of this gas.

The applications of glycerin have gone on increasing, and especially for nitro-glycerin and dynamite we note for it an unusual demand. The chemical nature of glycerin, its boiling point, its solvent properties, and the temperature of its distillation, have been made the special subjects of inquiry during the present year, and much progress has been made.

Another chemical product, called carbolic acid, has been subjected to numerous experiments until it has become an important article of commerce.

From this hasty summary, it will be apparent that chemists have not been idle, but have contributed a fair share of our general stock of useful knowledge.

PAINE'S ELECTRO-MOTOR.

We recently published a series of engravings illustrative of the above improvement, together with such information as had reached us concerning its actual and anticipated performances. We were a little fearful that our estimates, although derived from good sources, might be considered by the parties in interest as somewhat overdrawn. But it appears from a letter from Mr. Paine, which we elsewhere publish, that instead of over-estimating we have greatly under rated the capacity and merits of his alleged discovery.

He states that the electric engine now running at Newark, N. J., has been in constant operation for eight months, running nine hours a day, doing a duty of 67,000 foot-pounds (a little over two horse-power) with a consumption of only three ounces of zinc per day—a cost of less than two cents.

In previous articles in our columns bearing upon the subject of electro-motors, calculations have been given, showing that the mechanical equivalent for twenty-two pounds of zinc, or the consumption of that quantity of zinc in such a manner that its total mechanical effect could be realized, would be a duty of two horse-power maintained for nine hours. Between these calculations and Mr. Paine's statements, there is, consequently, a very wide difference.

Mr. Paine further tells us that he expects to realize from his new engines a force of sixty-seven millions of foot-pounds, or two thousand horse-power, at a cost of three grains of zinc; and that he will be able to drive the largest ship afloat (the *Great Eastern*, we suppose) by means of a single Bunsen quart cell, with a velocity only limited by the strength of the vessel. One hundred and fifty miles an hour will be a moderate velocity, according to Mr. Paine's science, for the future speed of the great ship.

With these wild dreams for a basis, it would seem like a difficult undertaking for the Paine Electro-Magnetic Engine Company to find purchasers for their scrip. But Mr. Paine assures us that he has secured a chosen band of adherents, composed of "men that you and I cannot mislead." We conclude that every bubble, like the dog, must have its day.

We have not space to discuss Mr. Paine's turpentine light which he gives us to understand still flickers, although, as a sensation, it long ago burned out.

THE INAUGURATION OF THE MORSE STATUE.

We do not believe there was a single right feeling individual in the entire civilized world who did not feel a glow of pleasure when it was announced that the telegraph operators of this country intended to erect a statue in Central Park, in honor of the venerable Professor Morse.

They gave their dollars, and procured the statue, and the inauguration took place last week, too late for notice in our last issue.

The ceremonies were of great interest. Speeches—of which that of the venerable Professor himself, which we give in another column, was the best of all—together with poetry and music, crowned the occasion, and thousands gathered together to show their appreciation of the event, and of him in whose honor the statue was erected.

The following was the order of exercises in the Park:

1. Music by the U. S. Band, of Fort Columbus.
2. Introductory address by Gov. Hoffman.
3. Unveiling the statue by His Excellency, Gov. Claflin, of Massachusetts, and Hon. William Orton.
4. Music.
5. Inaugural address: William Cullen Bryant.
6. Reception of the statue by Hon. A. Oakey Hall, Mayor of the City of New York.
7. Music.
8. Prayer by Rev. Stephen H. Tyng, D.D., rector of St. George's, N. Y.
9. Doxology, by band and people.

In the evening, the Academy of Music was crowded by interested citizens. Hon. Wm. Orton presided. Professor Morse sat at the right of the stage, the observed of all observers. After speeches by Messrs. Orton and Dr. George B. Loring, of Boston, the following telegram was dispatched to the telegraphic fraternity throughout the world:

"Prof. Morse sends greeting to those of the telegraphic fraternity throughout the world. 'Glory to God in the highest, peace on earth and good will to men.'"

Miss S. E. Cornwell, who transmitted the first message ever sent by the Morse system also transmitted this message, and Prof. Morse telegraphed his own signature, as the closing act of his telegraphic career. The utmost enthusiasm prevailed, and a more fitting tribute of a grateful people to a public benefactor never took place in this city.

FLYING MACHINE.

The famous old Novelty Works, in this city, once a scene of constant activity, now present an aspect of desolation. The machinery is all removed, and the entire floor of the principal building is empty, save that in the center stands a flying machine.

We know not who is the inventor of this machine. The watchman of the premises told us it had been left to its own devices for six weeks or more, and, strange to say, that it had proved a failure. A watchman's judgment, however, is not generally very reliable on such matters, and as our questioning failed to elicit any knowledge of the principles of the device, we examined it minutely ourselves. As many of our readers are interested in the subject of aerial navigation, we place before them a description of the mechanism.

It is designed to be driven by steam. A two-horse power vertical boiler is supported in a light frame at the bottom of the machine. At one side of the top of this frame is placed one of Root's rotary engines. On the shaft of this engine is a miter gear, which meshes into two others, one at the top and another at the bottom of the gear on the engine shaft. The two driven gears are respectively keyed to a solid shaft and a hollow shaft, the former rising vertically

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through the latter. Thus equal but reverse motion is secured in the two shafts.

Each shaft carries a propeller screw made of light metallic frame work, with blades of canvas stretched over skeleton frames of iron. The arms of the wings or blades are of hollow brass tubing, tapering from their junction with the shafts to the extremities of the wings. They are braced laterally and vertically by small iron rods. We judge the diameter of the counter propellers thus formed to be about twenty feet.

The object of giving them reverse motion is evidently to prevent the machine from spinning around on its vertical axis, as would be the case if only one propeller were employed.

These propellers must, if revolved rapidly, exert considerable elevating power, but the weight of the machine is evidently greater than their capacity, unless they are revolved at a velocity that would break some part of the machinery.

We long ago said that the solution of the problem of flying machines would be found in the discovery of materials of combined strength and lightness, yet unknown to science, and also in the invention of a motor having a power, in proportion to weight, comparable to that of the pectoral muscles of birds. Those who seek success in aerial navigation must first solve these preliminary problems, which, as every experiment in artificial flight demonstrates, are yet without solution.

THE EAST RIVER BRIDGE.---REPORT OF THE CHIEF ENGINEER.

Each step in the progress of this great structure increases public confidence in its ultimate successful completion, and demonstrates the ability of the controling mind in charge of the work. It is evident that the mantle of the late John A. Roebling, to whose genius the plan of the bridge is due, has fallen upon the shoulders of his son, Col.W. A. Roebling, who is now the Chief Engineer.

The reports made by this gentleman are characteristic of the man. They are like him in the absence of all attempt at vain display of technical knowledge, and in reliance upon the merits of actual performance as a basis for enduring reputation. When errors have been committed, they are frankly acknowledged; and where successful experiments have been tried, they are set forth in a moderate statement of facts, without undue elaboration, or any attempt at self-glorification, all the more praiseworthy as coming from a man who, though comparatively young, is building a monument to his own genius that will rank as one of the greatest, if not *the* greatest, of the gigantic works of the age.

One of the topics discussed at greatest length in the report, is that of the blowing out of the east caisson, "the legitimate result," as Mr. Roebling himself states, "of carelessness, brought about by an over confidence in supposing that matters would take care of themselves."

Our readers will find the account of this occurrence in another column, extracted from the report. As a graphic description of a very exciting and alarming event, it is scarcely inferior to anything we have met with.

We shall, as occasion offers, give further extracts from this interesting document.

WHITEWASH FOR OUTSIDE WORK.—Slake half a bushel of lime with boiling water, keeping it covered during the process. Strain, and add a peck of salt, dissolved in warm water; three pounds of ground rice put in boiling water, and boiled to a thin paste; half a pound of powdered Spanish whiting, and a pound of clear glue, dissolved in warm water; mix well together, and let the mixture stand several days. Put it on hot.

All the Leading Newspapers

Published in the United States may be found on file at the Advertising Agency of Geo. P. Rowell & Co., No. 40 Park Row, New York.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin. $4 00 a year. Advertisements 17c. a line.

Kansas Brick Machine.—Wm. Whiteford, Kansas City, Mo., challenges any manufacturer to compete with his patent machine for making brick faster and cheaper.

Air Cylinder Graining Machine.—A perfect tool for House Painters and Manufacturers of all kinds of Decorated Ware. Complete Machine for $50.00. Send stamp for Circular. The Heath & Smith Manufacturing Co., 44 Murray street, New York.

To Manufacturers and Inventors.—We have established a General Purchasing Agency for Mississippi. Best references given. Please send Circulars and Price Lists. O'Sullivan & Bro., Jackson, Miss.

Lyman's Gear Chart, with full directions for laying out the teeth of gear wheels, sent for 50 cents. Address Edward Lyman, New Haven, Conn.

Wickersly Grindstones. Mitchell, Philadelphia.

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Railroad Law in every number of the RAILROAD GAZETTE.

For the most perfect Band Instruments in the world, send to Isaac Fiske, Worcester, Mass. Illustrated Catalogues free on application.

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Soap Stone Packing, in large or small quantities. Greene, Tweed & Co., 18 Park Place.

For Sale.—An interest in a Patented Propeling Wheel for Canal Boats; or wanted, a partner with means to bring it before the New York State Canal Commission. Address H. F. Fenton, Cleveland, Ohio.

The Patent for the best Hydrant, or Fire Plug ever invented, for sale. For descriptions, terms, etc., address Lock Box 356, Lockport, N.Y.

Wanted.—A practical Mechanic, of experience, as foreman of a Door, Sash, and Blind Factory. Address Door, Sash, and Blind Co. Box 229, Columbus, Ohio.

Wanted.—The latest improved Machinery for manufacturing Horse Shoes, Horse Nails, Cut Nails, Pressed Spikes. Full particulars as regards capacity, etc., with lowest cash price. Address A. B., Box 83, Perth, Ont.

Oak Tanned Leather Belting and Manufacturers' supplies. Greene, Tweed & Co., 18 Park Place.

Diamond Carbon, of all sizes and shapes furnished for drilling rock, sawing and turning stone, conglomerates, or other hard substances also Glazier's Diamonds, by John Dickinson, 64 Nassau st., New York.

Peck's Patent Drop Press. Milo Peck & Co., New Haven, Ct.

For the best 15-in. swing Screw Cutting Engine Lathe, for the least money, address Star Tool Company, Providence, R.I.

Railroad Bonds.—Whether you wish to buy or sell, write to Charles W. Hassler, 7 Wall street, New York.

Experimental Machinery and Models, all sizes of Turned Shafting, Paper Box, Paper Collar, and Bosom Plaiting Machines, Self-operating Spinning Jack Attachments. W. H. Tolhurst, Machine Shop, Troy, N. Y.

Best Scales.—Fair Prices. Jones, Binghamton, N. Y.

Steam Watch Case Manufactory, J. C. Dueber, Cincinnati, Ohio. Every style of case on hand, and made to special order.

L. & J. W. Feuchtwanger, Chemists, 55 Cedar st., New York, manufacturers of Silicates of Soda and Potash, and Soluble Glass.

For Hydraulic Jacks, Punches, or Presses, write for circular to E. Lyon, 470 Grand st., New York.

A. G. Bissell & Co. manufacture packing boxes in shooks at East Saginaw, Mich.

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

The new Stem Winding (and Stem Setting) Movements of E. Howard & Co., Boston, are acknowledged to be, in all respects, the most desirable Stem Winding Watch yet offered, either of European or American manufacture. Office, 15 Maiden Lane, New York.

Belting that is Belting.—Always send for the Best Philadelphia Oak-Tanned, to C. W. Arny, Manufacturer, 301 Cherry st., Phil'a.

Send your address to Howard & Co., No. 865 Broadway, New York, and by return mail you will receive their Descriptive Price List of Waltham Watches. All prices reduced since February 1st.

Ashcroft's Low Water Detector, $15; thousands in use; can be applied for less than $1. Names of corporations having thirty in use can be given. Send for circular. E. H. Ashcroft, Boston, Mass.

To Cotton Pressers, Storage Men, and Freighters.—35-horse Engine and Boiler, with two Hydraulic Cotton Presses, capable of pressing 35 bales an hour. Machinery first class. Price extremely low. Wm. D. Andrews & Bro., 414 Water st. New York.

Tin Presses & Hardware Drills. Ferracute Works, Bridgton, N.J.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro, 414 Water st., N.Y.

Twelve-horse Engine and Boiler, Paint Grinding Machinery Feed Pumps, two Martin Boiler suitable for Fish Factory. Wm. D. Andrews & Bro., 414 Water st., New York.

Improved Foot Lathes, Hand Planers, etc. Many a reader of this paper has one of them. Selling in all parts of the country, Canada, Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N.Y.

For Fruit-Can Tools, Presses, Dies for all Metals, apply to Bliss & Williams, successor to May & Bliss, 118, 120, and 122 Plymouth st., Brooklyn, N.Y. Send for catalogue

Cold Rolled-Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Carpenters wanted—$10 per day—to sell the Burglar Proof Sash Lock. Address G. S. Lacey, 27 Park Row, New York.

Glynn's Anti-Incrustator for Steam Boilers—The only reliable preventive. No foaming, and does not attack metals of boilers. Price 25 cents per lb. C. D. Fredricks, 587 Broadway, New York.

The Merriman Bolt Cutter—the best made. Send for circulars. H. B. Brown & Co., 35 Whitney ave., New Haven, Conn.

Taft's Portable Hot Air, Vapor and Shower Bathing Apparatus. Address Portable Bath Co., Sag Harbor, N.Y. (Send for Circular.)

Winans' Boiler Powder.—15 years' practical use proves this a cheap, efficient, safe prevention of Incrustations. 11 Wall st., New York.

To Ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's Manufacturing News of the United States. Terms $4 00 a year.

Inventions Patented in England by Americans.

May 16 to May 23, 1871, inclusive.

[Compiled from the Commissioners of Patents' Journal.

BATTERY GUN.—A. H. Townsend, Georgetown, Col.
CAR COUPLING.—J. Crane, Cranford, N. J.
CARPET LININGS, ETC.—J. R. Harrington, Brooklyn, N. Y.
COVERING LEATHER.—G. W. McDaniel, Georgetown, D.C.
DECOLORIZING SIRUPS.—J. Brough, W. H. Gilson, New York city.
DRESSING LEATHER.—H. C. Havemeyer, New York city.
ELECTRO-MAGNETIC ENGINES.—H. Paine, Newark, N.J., and M. S. Frost, New York city.
FERTILIZER.—C. Morfit, Baltimore, Md.
FIREARM.—H. Berdan, New York city.
GENERATING GAS.—C. D. Elmer, Southold, N. Y.
HOLLOW WARE.—N. Thompson, Brooklyn, N.Y.
HULLS OF VESSELS.—E. M. Strange, New York city.
INSULATING WIRE.—A. G. Day, Seymour, Conn.
LAMP.—J. W. Bartlett, New York city.
NITRO-GLYCERIN.—H. D. Berrett, Washington, D. C.
PADDLE WHEEL.—E. Pratt, New York city.
PAPER PULP.—V. E. Keegan, Boston, Mass.
PICKING WASTE.—G. Palmer, Rochester, N.Y.
PREVENTING INCRUSTATION.—J. Perkins, Baltimore, Md.
PRINTING TELEGRAPH.—G.B. Field, E.W. Andrews, New York city.
RAILWAY CAR WHEELS.—R. M. Allen, L. W. Kimball, Pittsford, Vt., and W. H. Mallory, E. L. Butterfield, New York city.
REAPING AND MOWING MACHINE.—W. A. Wood, Hoosick Falls, N.Y.
REFINING SUGAR.—R. W. Bender, Boston, Mass.
STEAM ENGINE.—G. H. Babcock, New York city.
STEAM ENGINE.—J. Brandt, R. Lehr, Baltimore, Md., and C. G. Fisher, T C. Brecht, Washington, D.C.
TRANSPORTING LIQUIDS.—W. G. Warden, Philadelphia, Pa.

Foreign Patents.

The population of Great Britain, is 31,000,000; of France, 37,000,000 Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, while business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address MUNN & Co., 37 Park Row, New York. Circulars, with full information on foreign patents, furnished free.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at 1·00 a line, under the head of "Business and Personal"

ALL rererence to back numbers must be by volume and page.

LIQUID GLUES.—S. F. (query No. 8, May 27th) can make an excellent liquid glue by dissolving his glue in nitric ether. The ether will only dissolve a certain amount of the glue: consequently he need have no fears about making the solution too thick. The glue thus made is about the consistency of molasses, and is doubly as tenacious as that made with hot water. If a few bits of india-rubber, cut into scraps the size of a buck shot, be added, and the solution allowed to stand a few days, being stirred frequently, it will be all the better; and will resist dampness twice as well as glue made with water. The best liquid glue that I have any knowledge of is made as follows: Take of gum shellac three parts, caoutchouc (india-rubber) one part, by weight. Dissolve the caoutchouc and shellac, in separate vessels, in ether free from alcohol, applying a gentle heat. When thoroughly dissolved, mix the two solutions, and keep in a bottle tightly stoppered. This glue is called marine glue, and resists the action of water both hot and cold, and most of the acids and alkalies. Pieces of wood, leather or other substances, joined together by it, will part at any other point than at the joint thus made. If the glue be thinned by the admixture of ether, and applied as a varnish to leather, along the seams where it is sewed together, it renders the joint or seam water tight, and almost impossible to separate. The natives of the Maldive and Lacadive islands, and the Malays, of the coasts of Borneo and Sumatra, have a glue which they make as follows: They take the scales of a kind of fish, called by English and American sailors, salt water trout (identical with the salt water trout of the Gulf of Mexico), and after thoroughly washing them, place them in a glazed earthen jar, which they stopper tightly, and weight so that it will remain under water. They put this jar in a pot of water, and boil it until the scales are reduced to a semi-transparent viscous mass. This requires several hours boiling. Care should be taken that no water or extraneous matter, fluid or solid, be allowed to get into the jar with the scales. The glue thus made is the most tenacious, and at the same time, the most transparent and beautiful that I have ever seen. I have made it in this country from the scales of perch, trout, and bass. I am informed that a similar glue is made from the bladders of various fishes.—F. L. J., of Ark.

LEATHER FOR VISE JAWS.—C. A. W. wishes to know the best material for sticking leather to vise jaws. I have used, for years, pulverized rosin on the flesh side of clean dry leather, with entire satisfaction.—E. J. O., of N. Y.

NOISY GEARS.—If S. R. will make one of his large gears with wooden teeth, keeping the wooden teeth well lubricated with tallow, he will find that in place of a noisy gear, he has something that will run smoothly. I have seen large bevel gears, running very quietly, made in this way.—A. G., of Mass.

MOTHS.—If E. A. T. will use gum camphor, red cedar shavings, or spirits of turpentine, around the edges of his room under his carpet, he will find it a preventive against moths.—A. G., of Mass.

BOILS.—W. E. asks for a preventive for boils. He will find it in the beech drop, (*Epiphagus Virginiana*) a curious little plant found only under beech trees, as it is a parasite of the root of the beech. It is about one foot high, leafless, with a root covered with short brittle fibers, and appears only a short time before frost, which destroys its properties. Make a tea of the whole plant, and drink warm or cold instead of other drinks. If used liberally, it will remove boils, even after they have become painful, and is excellent whenever the blood is impure.—H. S., of Ohio.

BOILS.—If when W. E. first sees the little hard red bunch appear, he will take a sharp penknife, and cut into it, he will not have further trouble; at the same time keeping his bowels open (not with the knife) but by some kind of aperient. I like the saline effervescing aperients the best. I am not a physician, but I speak from experience.—F. C., of Mass.

MORE BOILS.—Apply a little dampened saleratus, about the size of a kernel of wheat, when the boil first shows itself; let it remain an hour or thereabouts.—J. G. C. P., of N. Y.

NOISY GEARS.—Let S. R. fill his gears tightly with some soft wood between arms, hub, and rim, and their noise will not trouble him.—G. D., of Va.

NOISY GEARS.—I would say to S. R. that it is a difficult matter for any one to tell the cause of the noisy gears, unless he is provided with diagrams of at least three teeth of each wheel. To test the gears properly, it is as well to know the number of teeth on each wheel, or their respective diameters and the depth they are geared at.—J. W., of Pa.

PLUMB RULE.—To your "Maine Carpenter" it is only necessary to say that the question was "how to make a plumb rule," not whether there was anything better. At the risk of being called *ancient*, I will say that at times I prefer a plumb rule to a spirit plumb level, particularly when great exactness is required. The best way to prove a plumb rule is to see that the edge is straight, and the center line parallel to it; and it will then prove itself most effectually. "That's practical."—J. H., of N. J.

DRILLING GLASS.—I have used a tin tube for drilling glass, arming it with spirits of turpentine and emery, and manipulating as your correspondents describe for brass tubes. The tin tubes work excellently in this way.—L. H. B., of N. H.

N. E. Y, of Mass.—While it is necessary for canal boats running in the same direction to pass each other occasionally, this is comparatively not of frequent occurrence. The loading or unloading of boats is not confined to either bank of the canal. Your other query has been already answered.

E. G. H., of Texas.—A life boat with air compartments would, by exhausting the air from the compartments, be rendered more buoyant, according to the weight of the air removed.

F. C., of Mass.—Your plan for propelling canal boats is essentially that of the Belgian system, prohibited in the prize competition.

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Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

BEDSTEAD.—The side rails have metallic plates attached at the ends, upon which are formed hooks, which enter mortises in the posts and engage metallic pins, in such a manner as to draw the parts tightly together. A flange formed on each plate also rests against the post, and makes the connection firmer. Sockets are also formed upon the plates to sustain cross-bars placed respectively at the head and foot of the bed. These cross bars sustain the longitudinal slats, held together in sections by cross bars, so that each section sustains the weight of the person resting upon it, independently of the other. Invented by Ira Deyo, of Pa.

ELEVATOR.—This improvement, made by Valentine C. Blair, of Wheatland, Pa., consists of pairs of lever clamps or catches, so pivoted that the action of a spring causes them to gripe with great firmness the slides, upon which the frame of the platform or cage slides up and down, in case the rope should break. The outer ends or levers are connected by links at the ends of a four armed bow, which bow is attached to the rope in such a manner that it keeps the ends of the clutching levers raised against the action of the springs, so that the latter cannot cause the clamps to take hold except in case of breakage.

COUGH CANDY.--Louis Violet, of New Lebanon, N. Y.—One pound extract of horchound and one pound extract of liquorice are dissolved in alcohol and boiled down to the consistency of paste, then mixed with four pounds of sugar, which were previously dissolved in water. The medicine is, as a gum filling, put up in candies of suitable shape and style, and is harmless to the stomach, but effective in curing inflammatory diseases and affections of the throat.

TIDY PINS.—The inventor claims to have discovered a principle of construction or new way of shaping the pin, so combining a lateral or branched head with a pair of opposite and short corrugations that a narrow recess is formed between them, in which the fabric will lie and prevent the pin from working loose or slipping out. Invented by Hial H. Newton, Cleveland, Ohio.

COMBINATION TOOL.—This is a new implement for use with sewing machines, which embraces in one tool a hook, a spring nippers, and a shears the hook being to take out or put in the shuttle and adjust the thread; the nippers being to take the end of the thread projecting through the eye in threading the needle to pull it through, also to hold and adjust the needle in setting; and the shears being to cut threads, cloth, etc. B. S. Burch, of Petersburg, Va., assignor to himself and William H. Baxter, of the same place.

RAILWAY RAIL JOINT.—This consists in a long flat plate having vertical slots, one on each side, near the center, two clips with upper ends catching on the base of the rail, and lower parts projecting down through the slots in the plate, the latter being placed under the rails; a gib for holding the ends of the clips below the plate from being forced together; and a key for clamping the clips and the plate together, said key passing under the plate transversely and through holes in the clips, and the plate resting at the ends on the ties. The inventors propose to employ a split key, having the ends so shaped that it will be prevented from working out. The plate may have notches on the edges of the part resting on the ties, coinciding with the notches in the edges of the bases of the rails, for reception of the spikes used to hold the rails down and to prevent end movement. The several parts forming this apparatus for joining the ends of the rails are all very simple in form, and may be made in wrought metal, either by rolling or stamping, making, it is claimed, a very cheap, simple, and efficient joint. Invented by George E. Morris ahd Charles W. Gregory, of Danville, Ill.

HYDRANT.—This invention is intended to provide hydrants having double discharge nozzles with a convenient valve, whereby either one of the nozzles can be closed, and it consists in the application to the hydrant of a swiveled lever carrying a disk or valve, whereby either one of the nozzles can be easily closed. Equidistant from the axes of both nozzles is swiveled in the head a stem, which is packed by a stuffing box, and can be turned on the outside of the hydrant by means of a key or handle. The inner end of the stem carries the lever, to which the valve or disk is secured. This valve or disk can, by turning the stem, be brought opposite the inner end of either nozzle, thereby closing it, or can be turned so the valve will not close either. When, in the ordinary double hydrants, one hose is secured, the second can only be applied by stopping the entire supply of water by the main cock, as otherwise the force of the water would prevent the attaching of the second hose. By the use of this invention the second nozzle could be closed by the valve when the hose is to be attached, while the stream through the other hose will not be interrupted. In case a hose bursts, which is frequently the case, the valve is immediately moved to prevent more water from flowing to it, while the other hose can be used without hindrance. The interruptions often fatal to the success of stopping a fire are thus made unnecessary. Joseph L. Pillsbury, of Columbus, Ohio, is the inventor.

PIPE WRENCH.—This invention consists in forming the serrated jaws of the wrench at particular angles to each other and their handles, which adapts them for seizing and holding objects, with, it is claimed, a facility and security unequaled by others hitherto used. The claim is a wrench, ormed of a fixed jaw and a movable jaw, both serrated, having the particu lar shape and angle shown, and provided, respectively with handles, as shown and described. William Henry Barwick, of Montreal, Canada, is the inventor.

BUILDING BLOCKS.—Nicholas Boch, assignor to himself and W. J. Maidhof, all of New York city.—In the middle of the rabbetted block or thereabouts is formed an oblong aperture to serve as a ventilating flue. These blocks are more particularly adapted for use in constructing buildings with stone fronts and brick backing: but the inventor thinks they will be found perhaps equally serviceable under other circumstances.

BOLT HEADING MACHINE.—In this machine, the clamping dies have two simultaneous movements at right angles to each other, while the header has but one; and the same screw pressure effects the whole, while it, at the same time, furnishes to the spring the stored-up power to retract the clamps. Invented by George Chapman, of Rockford, Ill.

ROCK-DRILLING MACHINE.—This invention relates to improvements in machines for drilling rock for tunneling and other purposes. It consists in an arrangement of adjusting supports on a vertical frame, upon one end of a truck, for shifting the drills and operating gears vertically and horizontally, the machine having four sets of drill supports and four drills. It also consists in certain novel swivel heads, in which the drills work, and by which they are mounted on the said adjusting supports, and by which also the drills may be pointed and held in any direction, each independent of the other. Norman W. Robinson, Burlington, Vt., is the inventor.

CURRIERS' SLICKER.—George T. Collins, of North Eastham, Mass., has invented a currier's slicker, which consists in an arrangement of the blade and handle and adjusting apparatus for moving the blade as it wears away, to have it project from the handle the same distance at all times, and also in the application to the handle of a strengthening band of iron, to prevent it from working. By this arrangement the blade may be moved forward as fast as it wears, and held firmly in position; also, the warping of the slotted part of the handle, by which the blade is often loosened in the common slickers, is avoided.

TOY GUN AND PISTOL.—A new combined spring and air gun, to be used as a toy and for target practice, consists in the use of a sliding barrel, which actuates an annular piston. The stock or handle of it holds a rigid cylindrical case, and a trigger, whose point enters the case through an aperture. A spiral spring is fitted into the case, so as to surround the barrel and be in contact with the front end of the case. An annular piston is placed loose around the barrel, within the case, so as to be interposed between a shoulder and a spring. The barrel can slide within the case, and, when pulled forward, draws the piston along and compresses the spring, until the piston has passed and is locked by the trigger. The barrel can then be pushed back into the case, without affecting the position of the piston. Its backward motion is arrested by an elastic ring, placed upon the headed front part of the barrel. The breech end of the case is open, but can be closed by a pivoted breech plate. When the barrel has been pushed back, after having locked the annular piston to the trigger, a dart, or light projectile of a suitable kind, can be placed in the back end of the barrel. When the trigger is next touched to release the piston, the spring will expand and force the piston back, whereby the air contained in the back of the case will be expelled through the barrel, causing it to expel the dart. Invented by H. M. Quackenbush, of Herkimer, N. Y.

CULINARY VESSEL.—This invention has for its object to improve the construction of culinary vessels, such as kettles, pots, boilers, etc., in such a way that the said vessels may be easily tipped or inclined to pour out their entire contents without danger of scalding the hands of the operator with the steam from the said vessel; and it consists in a jointed bail and catches, in combination with the body of the vessel, so that the handle being placed a little below the edge of the vessel, the hand, when grasping said handle, is entirely protected from the steam arising from said vessel. Samuel W. M. Chattaway, of Middletown, Conn.

SHUTTER WORKER.—This invention consists in an open skeleton bracket attached to the blind, and a toothed sector on the end of a spindle, the spindle passing through the window casing, with a handle on its other end, so that the sector can be turned, and the blind opened and closed by a person on the inside. By this improvement the trouble and annoyance of opening the window for opening or closing the blinds are avoided. When closed, the blind is securely locked by a tooth and bar, and when open, it is fastened by a catch. James W. Jedkins, of Monmouth, Me.

CARRIAGE SEAT.—Simon P. Graham, London, Canada.—This invention relates to sundry improvements in the rails, bottoms, spindles, and pillars of carriage seats, all tending toward increased simplicity, and cheapness of construction.

NAIL CUTTING MACHINE.—A. W. Paull and J. Morgan, Jr., Wheeling, West Va.—The invention consists in a novel means of holding the end of the nail plate firmly and immovably, whereby any pattern of nail blank and any exact number of nails to the pound may be always obtained with absolute uniformity.

POWER FOR SMALL MACHINERY.—Charles L. Johnson, Omaha, Neb.—This invention consists in an arrangement of parts, whereby a weight hung outside of the building, may be made use of for the purpose of operating a mechanism placed within the building, by which mechanism, when thus operated, any small machinery may be driven through suitable connections.

KILN FOR THE TREATMENT AND PRESERVATION OF WOOD BY THE ROBBINS' PROCESS.—John W. Fielder, Princeton, N. J.—This invention relates to an apparatus for preserving wood by what is known as the Robbins' process, that is to say, by placing wood in an air-tight kiln, and introducing therein to the vapor of creosote oil, which vapor drives moisture and air out of the pores of the wood, coagulates the albumen of the sap, thus preventing its putrefaction, and fills the pores with oil, thus rendering it secure from decay.

WATER METER.—Joseph W. Cremin, New York city.—This invention relates to the application of the device, known as Barker's Centrifugal Mill, to a water meter, the revolving hollow arms being placed within a case, and mounted on a hollow shaft, extending crosswise thereof, said shaft connecting at one side of the chamber with the supply pipe, and at the other side with the registering clock work, which is worked by the turning of the shaft through the agency of water rushing into the arms and out at holes in, or near, the ends of the latter, in the ordinary way of operation of the centrifugal mill.

CAR COUPLING.—James B. Harper, St. John, Mo.—This invention relates to an automatic car coupling, in which the drawheads are pivoted to the cars so as to be horizontally rotatory, and in which the link is pivoted at one end to one of the drawheads, and has at its other end a pointed head, with spirally cut sides, which head, when two cars are coupled, enters the other drawhead, the lips of which, acting on the spiral sides of the head, turn the same vertically until it enters the cavity of the drawhead, after which the said head turns horizontally so far as to present its rear side to the inner sides of the lips of the drawhead, and thus be held within the latter.

Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—APERIENTS.—I would like to ask some physician, whether the habitual use of aperients is injurious?—F. C.

2.—TURBINES.—I would like to learn through the SCIENTIFIC AMERICAN, if turbine water wheels, having gates placed beneath the wheel in draft tubes, to regulate the amount of water used, obtain any more useful effect from the water, or are any better, than the same wheel whose gates are placed so as to regulate the water as it enters the chute, or as it passes from the chutes to the bucket of the wheel? Does a wheel having its gate below it become any more of a reaction wheel than the same would if its gates were before, so as to regulate the water as it entered the shaft? and does it derive as much power from the direction of the water? And how is it when using partial gates?—J. C. W.

3.—BLEACHING WOOD.—Can any of your readers inform me of any good process for bleaching wood that has been stained or colored? I want to prepare it for use.—D. L. F.

4.—LIQUEFACTION OF NITROUS OXIDE.—Can any of your readers inform me what is the obstacle met with in the liquefaction of nitrous oxide gas on a large scale, by mechanical pressure or otherwise?—W. W.

5.—PREVENTING RUST.—I have a piece of machinery composed principally of tinned iron, or ordinary tin, and which, from the nature of the machine, it is necessary to keep in the cellar. It is covered with several coats of ordinary oil paint, which becomes sticky and soft, and the tin is beginning to oxidize or rust in spots. Can you inform me what paint I can use as a covering, that will resist the rust attacking it? Also what is the best thing to prevent the rusting of bright machinery that works in a cylinder, and is not easily accessible? Some parts of it are composed of bright steel, others of sections of clock springs, etc.—G. R.

NEW BOOKS AND PUBLICATIONS.

A MANUAL OF THE PRINCIPLES OF ROAD MAKING. Comprising the Location, Construction, and Improvement of Roads; Common, McAdam, Paved, Plank, etc., and Railroads. By W. M. Gillespie, LL.D., C.E. Tenth Edition, with large Addenda. Edited by Captain Cady Staley, A.M., C.E. A. S. Barnes & Co., New York and Chicago.

As a happy combination of practical information, and scientific elucidation of an important subject, this work might well be taken as a model, so far as it goes. Were the facts here presented more generally diffused, there would soon be a marked improvement in American roads. That the work has reached its tenth edition is evidence of its practical value. We think the editor might, however, have profitably substituted, for much of the matter relating to plank roads, a discussion of the more modern roads made of wood as well as a notice of various kinds, roads in which stones, coal tar, etc., are the materials employed. It is a little too late in the day to waste much time in the discussion of plank roads. In short, the book is scarcely up to the age on the subjects of which it treats, and so far as railroads are concerned, is not complete enough to be of great use to engineers. The information given as to earth roads, McAdam, and other well known kinds of roads, is sound and practical, and this we regard as giving the book its chief value.

SCRIBNER'S MONTHLY.

The July number of this popular illustrated magazine under the editorial management of J. G. Holland, formerly of the Springfield (Mass.) *Republican*, is just out, and may be had at any of the periodical stores, or of the publishers, Scribner & Co., 654 Broadway, New York.

THE AIR WE BREATHE.

This is an interesting essay, read before the Western Social Science Association, at its annual meeting for 1870, by W. H. Churchman, A.M. Published by the Indianapolis Printing and Publishing House.

SPECIAL REPORT ON IMMIGRATION.

Mr. Edward Young, Chief of the Bureau of Statistics, will please receive our thanks for a copy of the above named report.

Practical Hints to Inventors.

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How Can I Obtain a Patent?

Is the closing inquiry in nearly every letter, describing some invention, which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalties must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them: they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct:

Construct a neat model, not over a foot in any dimension—smaller, if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row, New York, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible, and send by mail. An answer as to the prospect of a patent will be received, usually, by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these, with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

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INDEX.

ILLUSTRATIONS.

A

Animal power, Hawes'....262
Anti-snoring device, Pinckard's... 34
Astronomical lantern, Clarke's....227
Attaching knobs to screws, Thurston, ...214
Automatic toy, Goodwin's....66
Awl, eyepointed, Bradford's....323

B

Band saw machine, First & Pryibil's....163
Belt tightener, Runk's....342
Belt tightener, Stansberry's....179
Blotter, ruler, and paper cutter, Ball's....291
Boiler feed, Cope & Maxwell's....278
Boring and mortising machine, O'Neal's....406
Boring machine, McBeth & Co's...182
Brick machine, Taylor's....18
Burning coal dust, Crampton's....290

C

Carbrake, Foster's....70
Carburetted hydrogen, Dunderdale's....3
Carriage hub, O'Connor's....399
Car spring, Potts'....178
Carving machine, Jordan's....255
Casting pulleys, Neemis'....146
Casting pulleys, Totten's....146
Chimney cleaner, Donohue's....2
Cistern filter, Lampson's....99
Cleaning device for soil pipes, Wright's....211
Closing ruptures in fire hose, Collins'....95
Coal ash sifter, Estey & Clough's..102
Combined tool, Wilkinson and Boyle's....66
Combined tool, Boardman's....179
Cork extractor, Rosenberry's....358
Corn husker, Phillips'....159
Cotton press, Boodon's....31
Cut-off, variable, Watts & Phelps' 47

D

Diamond drilling machine, Severance & Holt's....319
Door guard, Gschwind's....50
Door stop, Fahrney & Donaldson's.214
Dovetailing machine, Evarts'. . 102
Dovetailing machine, Knapp's....214
Drive well point, Edson's....30
Dumping cart, Hand's....278
Dyeing hair, apparatus for, Merriti's....355

E

Egg tongs, Hellen's....211
Elastic car wheel, Hunt's....198
Elastic wheels, Pilkington's....322
Electro-magnetic improvements, Paines'....370
Envelopes, Ellis'....195
Excavator and dredging machine, Sage and Alger's....271
Exercising Club, Dibble's....114
Extension table, Lenz's....126

F

Feed cutter, Garth's....406
Flask guide, Brown's....310
Flour bolt, Mitchell & Kessinger's.307
Flower pot and tree tub, Boomer's 246
Fluting and flat iron, Knapp's....114
Flying machine, Quimby's....402
Friction clutch pulley, Allen's 390
Furnace grate, Hildreth's....358
Furrowing hammer, Sauer's....246

G

Gate, Breese's....70
Gate, Hoskins'....3
Glass pulleys, Bicknell's....259
Grate bar, Greenleaf's....150

H

Hand sewing machine, Collier's....134
Hemmer, extension, Bartlett & Boomer's....287
Hoisting machine, Mason & Company's....246
Horse block and hitching post, Prescott's....322
Horse power hayfork, Steele's.... 150
Hot air register, Young's.... 383

I

Ice shaving machine, Gilliland's. 403
Impregnating wood with tar, Pustkuchen's....178
Infant dining chair, Smith & Co.'s. 182
Infantile power washing machine Highbarger's....146
Intrenching tool, Harrison's.... 51

K

Knitting machine, Bickford's....367

L

Labelling cans, machine for, Tyrrells'....303
Ladle for pouring metal, Benton's. 230
Lithographic machine, Hughes & Kimber's....15
Lubricating device, Reece's....54
Lubricator, Wickersham's....230

M

Machine for turning axle trees, Booth's....383
Magnetic motor, Stevens & Hendy's....390
Malt kiln, Geeman's....339
Metallic rocking chair, Berg's....128
Metropolitan railway, Hannah's..303
Milk pail and strainer, Drake's....291

N

Neck yoke ring and slide, Reat's...374

O

Oiling wool, machine for, Mayall's 2
Orewashing machine, Platt's.... 118

P

Packing box, Mershon's....343
Packing machine, Mattison's....227
Pipe wrench, Robbins'....326
Piston and packing, Chubbuck's.. 22
Piston packing, Smith's....82
Planking screw, Savage's....162
Pliers, Walker's....66
Plumb and level, Johnson's....214
Portable engine, Griffith & Wedge's 63
Post hole borer, Summers'.... 51
Pruning hook and saw, Schroy's..211
Pruningshears, Clinton & Harris'. 99
Push chair, Schopp's....383
Pyrometer, Bulkley's....130

Q

Quartz crusher, Varney & Rix's... 83
Quoin, Dorrity's....130

R

Railroad jack, Fox's....159
Recording steam gage, Edson's.... 38
Rectangular cheese, Holdredge's.. 6
Reinforce gun, Terrell's....191
Rifled guns, cast steel, Krupp's ..294
Road locomotive and steam crane, Aveling & Porter's....166
Rock tunneling machine, Henley's 354
Rotary oven, Wedges'....326
Running gear, Swartwout's....342

S

Salting meats, device for, Sadler's 262
Sash lock, Hovey's....358
Saw arbor, Heald's....246
Screw wrench, Burress & Cline's..211
Scrubbing machine, Irion's.... 82
Section roller and marker, Evans' 70
Sewing machine cover, French's.. 54
Sewing machine, Rayer & Lincoln's....86
Shears for trimming brushes, Brombacher's....258
Sheep shears, Mather's....226
Shoemaker's tool, Fishers.... 51
Shot case, Booton's.... 22
Slide valve, Collier & Mastermna's....142
Sound indicator, Cochrane's.... 95
Spittoon, Cayce's....262
Spoked wheel, Archibald's.... 195
Spring bed bottom, Willard's 198
Spring steps for stairs, Adkin's....195
Steam boiler, Allen's....134
Steam boiler, Tyler's.... 6
Steam engine, stationary, Cooper & Co's....207
Steam engine toy, Macy's....371
Steam road roller, Aveling & Porter's....162
Steam valve, balanced, Seifert's..294
Steam water elevator, Houghton's 226
Stove leg, Chubbuck's.... 22

T

Thimble and needle threader, Hunter's....355
Thread cutter, Henry's....374
Torpedo, Harvey's....386
Transplanting flowers, implement for, Wright's....259
Treadle motion, Proctor's....307
Trunk and rocking chair, Nye's...182
Turbine water wheel, Capron's....310
Type setting and distributing machines, Brown's.... 223

U

Utilizing waste heat, Ellis's.... 79

V

Ventilator for mattresses, Barnes' 182

W

Washing shield, Stow's.... 31
Water grate, Walker & Co's....111
Water pipe, non-corroding, Stow's 31
Waterproof dress, Merriman's.... 38
Water wheel, Trullinger's.... 18
Weather board bracket, Mulholin's....118
Wheat steamer and dryer, Hanna's 287
Wheels for traction engines, Pilkington's.... 322
Wine cellars, substitute for, Hydes & Wigfull's....342
Writing and copying case, Buzby's 179

MISCELLANY.

Figures preceded by a *Star* (*) refer to illustrated articles.

A

Accumulation of wealth.... 264
Acid and alkali works at Titusville.... 73
Acid, carbolic.... 280
Action is man's salvation.... 281
Adding register.... 283
Adhesion of gold leaf, to prevent the.... 118
Adhesive for leather belts.... 355
Adjustable animal power.... 170
Adjustable scaffold bench.... 315
Adjustable seat.... 250
Adulteration of articles in general use.... 160
Adulteration of petroleum.... 103
Adulteration of sirup.... 57
Æolian chimes.... 123
Aerial temperature.... 114
Aeronautic chimes.... 352
Agricultural items.... 33
Agricultural patents for 1870.... 115
Air holes in ice.... 37
Air in workshops.... 65
Air light.... 24
Air, supply of, to combustibles in furnaces.... 138, 232
Air we breathe, the.... 67
Alaska, climate and products of.. 132
Albumen, destructive action of.. 132
Alcoholic drinks, consumption of. 33
Alcohol from coffee.... 240
Algæ or sea mosses, food from.... 306
Alizarine, artificial.... 105
Allen engine at American Institute Fair, the.... 184
Alloy of lead and platinum.... 25
Alloys of copper, the.... 103
Amber varnish in chloroform.... 218
American desert a myth, the.... 35
American desert, the.... 18
American eclipse expedition, the. 152
American gas wells.... 56, *115
American Institute of Architects.... 243
American Institute of mining engineers.... 185
American Institute, proposed fair of the.... 39
American iron ships.... 211
American mechanic, the.... *258
American newspapers.... 345
American supply of arms to France.... 242
Anaconda skins tanned.... 281
Ancient and modern brickmaking.... 228
Aneurism, remarkable cure of. 66, 147
Anglo-Atlantic telegraph cables. 393
Animalculæ in oysters.... 57
Animal power.... 59
Animal trap.... 59, 123, 139, 219, 251
Annealing steel.... 208
Annual assay of the coinage.... 209
Answers to correspondents, 9, 26, 42, 59, 74, 90, 122, 138, 154, 170, 186, 201, 218, 235, 250, 266, 282, 298, 314, 330, 346, 362, 378, 394, 408
Answer to practical problem.... *179
Anthraflavic acid.... 298
Anti-friction balanced valve.... 234
Anti-friction compound.... 187
Antiquity of pulpits.... 51
Anti-rocking attachment for railway cars.... 267
Apatite, the uses of.... 120
Apparatus for covering cords, etc. 283
Apparatus for drawing beer, etc. 234
Apparatus for drying bone black. 283
Appeal from Russia, an.... 69
Application of steam to canals 369, 384, 400
Applied science popularized.... 49
Aqua ammonia, domestic use of.. 245
Arborescent grasses.... 25
Archimedean screw and centrifugal pump.... 307
Architecture, iron in.... 277
Arctic exploration.... 321
Arctic telegraph, the.... 197
Are noisome effluvia injurious to health?.... 288, 296
Artesian well at Denver, Cal.... 211
Artesian well in Louisiana.... 288
Artesian well in Philadelphia.... 17
Artesian well on Union Pacific Railroad.... 374
Artificial jewelry.... 208
Artificial leg.... 139
Artificial production of coniine.. 161
Artificial stone.... 248
Artificial stone, Roman and Egyptian.... 100, 197
Ash sifter.... 139, 251, 299
Asphalting garden walks and street pavements.... 353
Asymmetry, curious case of.... 143
Atlantic cables, the broken.... 99
Attaching hairspring collet to watch.... 202
Attachment for sash weights.... 347
Attachment to oil well tubing.... 283
Auger.... 75
Auger, hollow.... 107
Auger, well.... 107
Aurora Borealis.... 21, 160
Automatic band cutter, etc.... 10
Automatic barrel filler.... 10
Automatic closing gate.... 250
Automatic toy.... *66
Average city dwelling house.... 120
Awning frame for animals.... 251
Aymara Indians in Peru.... 240, 324

B

Babbitt's metal.... 106
Baby carriage.... 202
Baby tender.... 315
Bacon in Hampshire, England... 82
Bagatelle.... 395
Bag holder.... 27
Balanced slide valves.... 26, 267
Balance for shafting, etc.... 10
Baling press.... 154
Ballooning.... 69
Balloon postal service during the siege of Paris.... 260
Balloon propeller.... 257
Balloons as a means of Arctic research.... 100
Balloons, copper.... 2,5
Bamboo, new use for.... 264
Barn door hangings.... 267
Barometer without mercury.... 3, 8
Barrel handles.... 27
Barrel rolling apparatus.... 282
Base ball.... 309
Bathometer and other instruments for exploring the sea.... 345
Battery, a cheap galvanic.... 329
Battle of the tires.... 24
Beams and girders.... 84
Beams and girders, how affected by loads.... 196
Becquerel, Sr., not dead.... 392
Bedbugs, to kill.... 378
Beds and upholstery.... 59
Bedstead.... 139, 409
Beehive.... 91, 231
Bee stings.... 20
Beet root sugar in California.... 21
Beetroot sugar in Massachusetts. 231
Belgian rails.... 25
Bellaire, Ohio, prosperity of.... 215
Bell making in Birmingham.... 112
Belt, quarter twist.... 9, 42
Belts, to calculate the width of.. 330
Belt tightener.... 91
Bench vise.... 267
Benefits of science.... 130
Benzoic acid, new source for.... 296
Benzole from coal tar and petroleum.... 296
Benzole, preparation of.... 312
Bérard's new process for steel.... 325
Bessemer process, W. M. Williams on the.... *131
Bin cover.... 107
Bird cage mat.... 330
Bird trade, the American.... 130
Birds' tails not for ornament only.... 244
Birds, the flight of.... *194, 244, 276
Bisul hide of carbon.... 263
Bit brace.... 207
Bituminous coal trade in 1870.... 102
Black copper.... 114
Blacking, harness.... 9
Black ink.... 81
Blasting extraordinary.... 6
Blind regulator.... 139
Blind wiring machine.... 219
Blood, uses of.... 41
Blowpipe as an aid to the drill, the.... 311
Boat detaching apparatus.... 283
Bobbin winding machine.... 395
Body, is electricity produced from the living?.... 227
Boiler capacity.... 26
Boiler explosions.... 113
Boiler furnace.... 250
Boilers, firing of steam.... 247
Boilers, heating surface of.... 26
Boilers, testing, by steam pressure.... 8
Boils, preventive for.... 408
Boils, to cure.... 379, 394
Bolt.... 251
Bolt heading machine.... 409
Bonard, Louis.... 345
Boot blacking.... 170
Borate of iron.... 9
Borax.... 195
Boring cylindrical rings.... *35, 99
Boring for oil.... *243, 292
Boring machine at Mont Cenis.... 31
"Boss" blacksmiths.... 324
Boxford, Connecticut.... 49
Boxwood.... 58
Boynton's lightning saw.... 105
Brain weight.... 305
Brake for railroad cars.... 123, 267
Brass, a new.... 192
Brassey, anecdote of Thomas.... 161
Brass tops of lamps.... 235
Breaking of car axles.... 130
Breech-loading cannon.... 314
Breweries and their fittings.... 371
Brewers of New York, ancient... 129
Brick lifter.... 315
Brickmaking challenge.... 232
Bridge.... 331
Bridge at St. Louis.... 20
Brittleness in brass wire.... 330, 346
Broad cast fertilizer distributer.. 395
Broad cast seeder and cultivator. 202
Broiler.... 282
Brunel, I. K., extract from the diary of the late.... 113
Brush, bathing.... 154
Brick saw frame.... 331
Buenos Ayres, plague in.... 357
Building blocks.... 409
Buildings, heating.... 33
Burner for lamps.... 234
Burning and unburning.... 85
Burns and scalds.... 80
Burns, remedies for.... 33
Bursting of furnace.... 218
Buttons, manufacture of.... 21

C

Cactus plants.... 25
Caisson for east pier of St. Louis Bridge.... .... 230, *239
Caisson for East River Bridge, New York.... 216, 229
California, crops in.... 410
California, raisins in.... 245
Calipers.... 43
Camel's hair.... 329
Camels in Washoe.... 66
Camera box.... 299
Camphor.... 322
Canada, maritime power of.... 163
Canal navigation.... 279
Canal propulsion, new plan for.... 288, 295
Canals, ancient and modern.... 360
Can and ventilating stopper.... 202
Canceling stamps.... 123
Cancers.... 217
Candies, unwholesome.... 194
Candle molding machine.... 234
Cannopus, the decree of.... 281
Carat, what is a.... 374
Caravans.... 369
Carbolic acid and fleas.... 392
Carbonic acid.... 32
Car brake.... 187
Carburetting hydrogen gas, Ambuhl's apparatus for.... 374
Car coupling.... 10, 59, 202, 331, 409
Carotine.... 290
Carpet cleaning machine.... 187
Carpet rag looper.... 154
Carpets.... 322
Carriage seat.... 409
Carriage top.... 362
Carriage wheels.... *315
Car seat back locks.... 10
Cartridge belt.... 107
Cartridge making.... 58
Car ventilator.... 75
Car wheel molds.... 43
Case for printer's use.... 202
Case hardening.... 298
Caseine.... 89
Casting grooved rollers.... 154
Cast iron barrels.... 91
Cast iron chimney.... *66
Castor bean in California.... 153
Catacombs of Rome.... 98
Catgut.... 357
Causes of summer diseases.... 368
Caustic, convenient mode of using.... 89
Cave in Thomas Co., Georgia.... 113
Ceiling for stages.... 251
Ceiling, the world in the.... 290
Cement.... 107
Cement, a new.... 66
Cement for China ware.... 346
Cement for gas holders.... 282
Cement for glass syringes.... 235
Cement for leaks in gas holders.. 282
Cement for leather.... 408
Cement for marble.... 282
Cement from gas lime.... 117
Cement, Portland.... 338
Census, the ninth completed.... 100
Central discharge water wheel.... 75
Central shaft of the Hoosac tunnel.... 184
Chalking joints of wood.... 401
Chamber.... 10
Chamois leather.... 362
Chapped hands.... 251
Charcoal, nature and manufacture of.... 200
Charging woods with preserving liquids.... 139
Cheap battery.... 170, 330, 362
Cheap building stone.... 328
Cheese hoops.... 202
Cheese making.... 134
Chemical products, new.... 57
Chemical science, progress of.... 7
Chemical works, supposed ancient 346
Chemistry in agriculture.... 36
Chemistry of honey.... 276
Chemistry, the last six months of 407
Chemists who died in 1870.... 4
Children's cribs.... 202
Child's bib 331
Chinese composition, new.... 65
Chinese ink.... 321
Chinese ornaments or curiosities.... 352
Chinese waterproof cement.... 328
Chloral, manufacture of.... 105
Chloralum.... 9, 154
Chlorides of tin.... 330
Chlorine, narrow escape from suffocation by.... 137
Chloroform used in this country. 392
Cholera, supposed fungoid origin of.... 274
Choose a puppy, how to.... 85
Chronopher, the.... 249
Churn.... 75, 234, 315, 363
Churn dasher.... 43, 251
Cider or wine mill.... 251
Cigar machine.... 10
Cinchona alkaloid, a new.... 296
Cinchona tree, cultivation of.... 264
Circular saws, annular.... 171
Circular saws for stone work.... 385
Circular saw guard.... 187
Cistern, how to construct a.... *147
City railway in Brooklyn.... 308
Clamp.... 75, 122, 395
Clarinet.... 59
Cleaning guns.... 298, 363
Cleaning steam fire engine boiler 43, 241
Clean paint, to.... 345
Climate of the Argentine Republic.... 336
Climatology of Bright's diseases.. 306
Close of another volume.... 407
Clothes clamp.... 379
Clothes dryer.... 234, 347
Clothes frame.... 43
Clothes line holder 43
Clothes pin.... 10, 43, 251
Cloth rollers.... 394
Clover stripper.... 123
Cloves.... 361
Coal as a building material.... 303
Coal-cutting machine.... 132
Coal dust for fuel, utilizing.... 371
Coal in India.... 344
Coal-pit fire.... 162
Coal scuttle.... 315
Coal slack.... 194
Coal-tar colors.... 73
Coal-tar gravel walks.... 186
Coal-tar products.... 344
Coating iron and steel with molten iron.... 277
Coating sheets of iron.... 202
Cochineal insects and their allies *274, 306
Cock, basin.... 43
Cod liver oil.... 102
Coffee, how to make.... 70
Coffee mill.... 139
Coffee strainer.... 43
Coke furnace.... 75
Coke furnace for heating irons... 283
Collodion balloons.... 50
Color blindness.... 378
Colored cements.... 105
Colored fires.... 165
Colors of the sea.... 271
Comb.... 250
Combination tool.... 409
Combined brake and starter for vehicles.... 202
Combined cider mill and press ... 283
Combined corn planter and cultivator.... 202
Combined cotton and corn planter 187, 331
Combined cotton planter and guano distributer.... 170
Combined cotton planter, etc 10
Combined cotton seed and corn planter.... 10
Combined cotton seed planter and cultivator 267
Combined crimping and sad iron.. 171
Combined foot rest and bootjack. 10
Combined hay rake and tedder... 234
Combined heating and cook stove 171
Combined ore crusher and amalgamator 219
Combined ruler, blotter, and paper cutter 187
Combined plow and scraper.... 283
Combined sad and fluting iron.... 219
Combined sawing machine.... 234
Combined tool.... 347
Combined vise and anvil.... 395
Combined washer and wringer.... 250
Commerce of the world.... 58
Commissioner of Patents, Report of.... 121
Commissionership of Patents.... 9
Compass plant.... 193
Composing machine.... 86
Composition for coating photographic pictures.... 299
Composition for staining wood.... 218
Composition of meteors 297
Compound engines.... 295, *340
Compound engines, C. E. Emery on 359
Compound for vapor generator.... 107
Compressed air in coal mining.... 358
Condensed milk, manufacture of. 192
Conducting wires for military telegraphs.... 191
Connection for the induction coil 377
Connecting rod 75
Constant battery 122
Construction of horse rake.... 202
Construction of waterproof cellars, etc.... 250
Consumption of sugar, coffee, and tea 185
Contractors, the modern order of 335
Cooking, sewing and 85
Cooperative buttermaking.... 273
Cooperative cheesemaking in the United States.... 339
Copying ink.... 394
Corn dropper 91
Corn planter.... 43, 139, 282, 299
Corrections of Mr. L. Allen's mode of determining the percentage of water in steam 357
Cosmetics.... 182
Cost of living on the Pacific coast 149
Cost of water in New York city... 200
Cotton and hay press.... 26
Cotton chopper 107
Cotton cultivator 26
Cotton gins.... 145
Cotton mills at Fall River.... 341
Cotton planter 170, 347
Cotton press 251, 330
Cotton seed and guano drill 283
Cotton seed oil in England.... 249
Cotton seed planter.... .... 42, 59
Cotton worm *290
Cough candy 409
Countersinking attachment to boring instruments.... 170
Covering for melting pots.... 251
Cow's tail holder.... 202
Cracked sovereigns.... 371
Crawling and gathering of varnishes 245
Creeping baby doll 202
Crowbar with joints.... 281
Crushing and grinding rock phosphates.... 331
Cryolite and its uses 89
Crystals found in plants.... *307
Culinary boiler 395
Culinary vessel.... .... 234, 409
Cultivation of rice.... 377
Cultivation of the fig 305
Cultivator.... 139, 154, 234, 379
Cultivator, Mahon's.... .... 10, 11
Cultivator, Smith's 10
Cups for winding machines.... 395
Cure for tobacco chewing.... 265
Curiosities of genius relating to inventions 211
Curiosities of scientific literature 96
Currier's slicker 409
Cushions on legs of work benches 342
Cutter.... 75
Cutting blanks for toothed wheels *250
Cutting fine threaded screws.... 250
Cutting glass by blowpipe flame.. 249
Cutting glass, easy method of.... 399
Cutting small brass screws.... 250
Cutting teeth of small wheels 314
Cutting tobacco.... 165
Cut-off attachment to slide valves 234
Cut-off for blast furnace 283
Cut-off, variable 47

D

Damper.... 219
Damper for dust flues 107
Dangerous burning fluid 293
Dangerous dentistry.... 216
Dangerous oils *versus* dangerous lamps 212
Dangerous water pipes.... 33
Dangerous well water.... 280
Dangers of petroleum oils.... 151
Danger to ocean cables 368
Daniell's battery, improved form of.... 150
Days' work? how many hours constitute a.... 401
Decisions at the Patent Office, recent.... 137
Decisions by the Commissioner of Patents.... 312, 313
Decolorizing sirups.... 165
Decomposing water by electricity 122
Decomposition of white light.... 376
Deep mines.... 128
Deep sea currents.... 229
Deep sea soundings and water.... *245
Defects in locomotive boilers.... 43
Defense of Paris, the 49
Demerara, Kaieteur waterfall in.. 339
Dental lathe.... 59
Dental preparation 129
Dentists' instrument stand.... 267
Dentition of babies, etc.... 266
Deodorizer, iron as a.... 275
Descent of man 259, 361
Desk, folding.... 107
Detecting fraud, singular mode of 80
Detection of blood stains.... 161
Detection of substances by the blowpipe 345
Determining the percentage of water in steam 312
Device for opening and closing window blinds.... 363
Device for piercing and lining ear lobes 234
Diamond drills.... 372
Dies for forming horse collar shells 282
Dip your razor in warm water.... 325
Direct action water wheel 299
Discovery and invention.... 84
Diseases of the eyeball.... 325
Disinfectants.... 390
Disinfecting compound.... 283
Dividing wheels of knitting machines.... 314
Doctoring iron 375
Dolomite, new use for.... 41
Domestic silk trade.... 113
Double churn dasher 315
Doubletree fastener.... 10
Dovetailing machine.... *102, *214, 363
Downfall of Paris 103
Drawer 54
Drawer pull 107, 239
Dredging and excavating machine.... .... *403
Drilling glass.... .... 379, 408
Drill lubricator 211
Drop hammer lifter.... 43
Dry dock.... 202
Drying phosphates.... 331
Dualin 36
Duluth to the ocean, from 328
Dumb bells 315
Dumping car 283
Dumping cart 250
Durability of timber, is it affected by the moon?.... 244
Dyeing Turkey red 57
Dyer's recipes.... 129, 149, 165, 193, 225
Dynamite in artesian wells, use of 392

E

Earth closet system, the *326, 372
Earthquake in China, tremendous 406
Earths and alkalies used in pottery.... .... 293, 337
Eastern Virginia.... 324
East river bridge, blowing out of the east caisson 402
East river bridge—report of the chief engineer.... 408
Eclipse expeditions, the.... 88
Eclipse, Mr. Norman Lockyer on, the 144
Eclipse, the solar 200
Economizing fuel and preventing smoke.... 356
Editorial summary.... .... 281, 329
Eel trap for water pipes.... 251
Effect of hard and soft water on the muscles.... 329
Effect of heat and cold on iron and steel.... .... 167, 176, 228, 263, 308
Effects of modern traveling on health and longevity 232
Effects of the bombardment of Paris 265
Elastic and tensile strength of wrought iron.... 329
Electrical and other experiments, new 240
Electrical gaslight apparatus.... 250
Electrical shadows and images produced by electricity.... 402
Electric batteries, liquid for.... 216
Electric car brake.... 360
Electricity from the living body.. 227
Electricity on the blood, effect of 260
Electric joke, an.... 265
Electric light.... 391
Electric light in warfare 281
Electro coppering 316
Electro deposition of copper and brass 119
Electro magnet 154
Electro magnetic motor, Paine's 167, 212, *376, 404, 407
Electro metallurgy 135
Electro motor, Paine's 375, 407
Electroplated signs 281
Electrotyping, to prepare casts for 218
Electrotypy 192
Electrotypy—imitation of leather 406
Element of success, observation an 323
Elephantiasis.... 261
Elevator 202, 409
Embalming process and solution . 107
Embroidery by machinery.... 219, 389
Emery wheels 235
Employment of females in New York 248
Enameled writing surfaces.... 193
Enameling photographs.... 265
Enameling wood work 112
Endless platform railway for New York 217
Engineering in India 52
Engineering on the Clyde.... 144
English and American scientific journalism 87
English patent laws, proposed revision of.... 21
Envelopes, improvement in.... 202
Erie Canal 311, 359, 376, 388
Evaporating liquids in sugar refining.... 136
Examination of engineers and boiler tenders 372
Examination of pharmaceutists.. 219
Excavations and embankment tables.... .... 103, 133
Excavator 234
Exhibition in London, International.... 383
Experiments on the oxidation of iron 257
Exploding charges by electricity. 130
Explosion of an emery wheel 340
Explosion of cylinder for drying cotton.... 291
Explosion of gasoline reservoir.. 8
Explosive oils and lamps 260
Extension bridge.... 314
Extension ladder.... .... 123, 251
Extension pulley 283
Extension table 363
Extract of meat.... 401
Eyes, the, and how to take care of them 64

F

Facts about copper.... 246
Facts about the sun.... 277
Facts and figures about the Mont Cenis tunnel.... 55
Facts in the natural history of the honey bee 309
Facts relative to the Erie canal... 327
Fallacies in building.... 356
Fall River, an idle day at.... 53
Family reading.... 193
Fan blast regulator.... 331
Fanning mill 11
Fastening end boa ds on wagon boxes.... 154
Faucet 171
Faucet for drawing beer, etc.... 123
Feed bags for horses.... 187
Feeder for sewing machines.... 395
Feed for nail machines 251
Feeding blast furnaces 395
Feed water heater.... 107
Felt, waterproof French.... 153
Female magnetism on the com pass, influence of 352
Fence 10, 170
Fence post.... 10
Fender and gage wheel.... 139
Fender, etc., to fire grate 283
Ferrule 283
Fetter for fowls 43
Fibers, to distinguish vegetable.. 153
Fifth wheel for carriages.... 347
File for papers 107
Filing and setting machine.... 219
Filling the issues of turbines.... *308
Filter for rain water cistern 90
Filtering water.... 42
Fircarms 234
Fire back for fireplace 154
Fire coroners.... 401
Fire escape.... .... 59, 84
Fire escape ladder.... 170
Fire extinguisher 331
Fire in Paris, precautions against 33
Fireplace fenders 395
Fireplace grate 299
Fire tongs 75
Firing of steam boilers.... 247
Fish net supporter.... 267
Five milliards of francs 249
Flavor of fruits, increasing the 321
Flax thrashing and separating machine 379
Flexible rock (itacolumite).... 262
Flock cutting machine.... 347
Flower stand.... 234
Flues in boilers 314
Fluids through pipes, conveyance of.... 71
Flying machine.... 407
Flying machine in San Francisco 102
Flying spiders.... .... *341
Fog signals 273
Folder and tucker.... 379
Folding settee.... 379
Food from algæ, or sea mosses ... 306
Force pump 395
Foreign tribute to American mechanics.... 383
Forest trees in Iowa.... 345
Fortunes in scraps.... 117
Fossil forest in California.... 276
Fossil ivory in Alaska 281
Foundations for buildings 37
Fountain blacking brush 123
Fountain paint brush.... .... 75, 251
Franco-Prussian war.... .... 17 38

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French Atlantic cable, the..... 322
Frendeet, worm in Africa..... 41
Fresco painting..... 287
Friction clutch for mowing machines..... 267
Frosted feet, to cure..... 153
Frosted silver..... 235
Fruit growers' check and holder.. 233
Fruit trees, treatment of..... 91
Fuel to furnaces, feeding..... 202
Fund for relief of sufferers in France..... 163
Furniture caster..... 315
Furniture polish..... 401
Fuse for rifle shells..... 10

G

Galvanic battery, a new..... 296
Galvanized gray iron..... 59
Galvanized water pipe..... 356
Gang plow..... 91
Gas burner..... 202
Gas burner, a new..... 405
Gas from the residuum of petroleum..... 249
Gas in London, testing..... 230
Gas pressure regulator..... 331
Gas well at Buffalo..... 352
Gas wells in Ohio..... 66, 342
Gate..... 299
Gate, Franklin's..... 91
Gate, Sebley's..... 91
Gear cutting on foot lathe..... 362
Gearing circular saws..... 107, 122
Gear wheels in a lathe, to cut..... 330
Gelatin from bones, etc., Rice's process..... 355
Geography of the sea bed..... 49
Geological museum at the School of Mines..... 227
Gigantic Turk, a..... 103
Gilding, out door..... 90
Girder rests for timbers..... 363
Glass cutting..... 20
Glove..... 363
Glue, use of..... 117
Glycerin in Cincinnati, manufacture of..... 198
Glycerin soap..... 312
Gold nuggets, formation of..... 407
Gold ornaments..... 163
Government Bureau of Mines..... 151
Governor for steam engines..... 187
Grafting wax..... 235, 346
Grain binder..... 395
Grain drill..... 234
Grain dryer..... 171
Grain hulling machine..... 233
Grain mill, to put in order..... 36
Grain or seed separator..... 331
Grain scourer..... 10
Grain separator and fanning mill 171
Grape sugar..... 343
Grate bar..... 234
Grate for furnaces..... 107
Gravel and sand heater..... 59
Great speech, a..... 392
Green glaze for flower pots..... 219
Grist mill and cotton seed huller 299
Guess work and real work..... 391
Guide for sewing machines..... 43
Gun cotton..... 22
Gun maker's and inventor's club, Birmingham, England..... 376
Gunpowder experiments..... 326
Gunpowder in close chambers, firing..... 297

H

Hailstones..... 79
Hail storm in 1870..... *19
Hail storm, remarkable..... 322
Hair trade, the curled..... 118
Hames..... 59
Hand turning and boring machine 234
Hardening tallow..... 201
Hartford Steam boiler Inspection and Insurance Co., 34, 116, 177, 229, 297, 362
Harvester binder..... 363
Harvester rake..... 202
Harvesters..... 208
Harvest, ice, in 1871..... 161
Hat sizing machine..... 154
Hay and cotton press..... 123, 379
Hay fork..... 219
Hay loader..... 251
Hay press..... 59
Hay rake..... 234, 379
Hay rake and loader..... 139
Health in old age..... 312
Healthy soil and water..... 312
Heating apparatus..... 331
Heating by water..... 342
Heating stove..... 202
Heliographic printing..... 297
Hell Gate obstructions, removal of the..... 295, *319
Hematite, Professor Osborn on brown..... 4
Hemmer and binder for sewing machine..... 363
Hens lay, how to make..... 17
Hinge, double..... 43
Hinges for table leaves..... 315
Hinges, to select..... 212
Hints to mechanics..... 71
Historical and antiquarian collections in New York..... 257
Hitching post..... *84
Hog, scientific and theological aspects of the..... 149
Hoisting apparatus..... 10, 234
Honey, crystallized..... 180
Honey, preservation of..... 99
Honey, rose colored..... 191
Honey trade, the..... 133
Honing razor..... 378
Hoop backing machine..... 10
Hoop skirt..... 154
Hoosac tunnel..... 35
Horace Greeley as a steam plowman..... 404
Horoscope..... 394
Horse collar pads..... 27
Horse collars..... 282
Horse detaching apparatus..... 347
Horse railways, Sir J. Whitworth 153
Hose bridges..... 202
Hot air furnace..... 395
Household implement..... 91
House plants..... 277
How eyes are made..... 111
How matches are made..... 389
How printing ink is made..... 389
How to banish fleas..... 393
How to build a chimney..... 180, 292
How to make a plumb rule..... 360
How to preserve eggs..... 394
How to prevent spring sickness.. 226
How to prove a plumb rule, ... 209, 260, 356
How we stand and walk..... 16
Hudson River Railroad disaster, 117, 135
Human hair, imitation of..... 161
Human mind and human hand..... 200
Hum of insects, the..... 260
Hundred years ago, one..... 144
Huxley, Professor Thomas Henry, biographical sketch of..... *1
Huxley, Professor T. H., plan of education..... 81
Hydrant..... 409
Hydrate of chloral..... 341
Hydrate of chloral as a reducing agent..... 361
Hydrate of chloral, ill effects of 89, 198
Hydrate of chloral, new form for use of..... 192
Hydraulic apparatus for ships..... 128
Hydraulic engine..... 331
Hydraulic mining apparatus..... 10
Hydrocarbon oil lamps..... 228
Hydrocarbon vapor burners...379, 395
Hydro-electric cable..... 137
Hydrogen, cheap..... 89
Hydrostatic galvanic gas lighter. 361
Hygrometer, the steam..... 313, 356
Hyposulphite of soda, tests for.... 3

I

Ice bridge in the East river..... 136
Ice harvest in 1871..... 161
Ice house..... 26
Ice machines, comparison of..... 264
Ice, manufacture of..... 186
Ice phenomenon..... *147
Ichthyosaurus or fish lizard..... 233
Igniting gas, Klinkerfues' apparatus for..... 393
Illinois and St. Louis bridge..... *386
Illuminating apparatus..... 251
Illustrating trigonometry..... 395
Imitation of ebony..... 282, 314
Imitation of human hair..... 161
Imitation of rosewood..... 201
Immigration, special report on... 343
Improvement in lead furnaces.... 289
Improvement in plows..... 118
Improvement in preserving wood 309
Improvement in the manufacture of salt..... 281
Improvement of railways, suggestions for the..... 248
Impurities in white lead..... 244
Increasing the hight of rooms.... 352
Incrustation of boilers..... 97
Indian mode of casting In metal.. 225
India rubber shoes..... 154
Industrial competition..... 116
Infringement trial..... 345
Ingenious contrivance..... 388
Ingrowing toe nails..... 65, 115
Ink, black..... 81
Inspection of steam boilers..... 295
Inspection of steam boilers in Ohio..... 215
Instruction in industrial drawing, free..... 244
Instruments in storm signal service..... 245
Insulating covering for boilers... 117
Insulation of telegraph wires..... 105
Interesting coal history..... 241
Interesting experiments in color 289
Interior of the earth solid or fluid? is the..... 213
International industrial competition..... 72
Invalid bedstead..... 107, 363
Invention, antiquity of..... 4
Inventions patented in England by Americans, 11, 26, 43, 75, 106, 122, 138, 155, 187, 203, 219, 234, 249, 268, 282, 299, 316, 347, 363, 380, 408
Inventions suggested by the civil war..... 101
Invention, to cleanse the streets of snow, wanted an..... 103
Invention *versus* discovery..... 388
Invention, wanted an.... 161, 323, 372
Inventors, what they have done.. 276
Iodine from residue, recovery of, 137
Iodine, quantitative determination of..... 405
Irish poplin, manufacture of..... 116
Iron abutment for bridges..... 123
Ironclads of the United States.... 306
Iron in architecture..... 277
Ironing table..... 47
Iron in New Jersey..... 224
Iron rails for common roadways 247
Iron railway sleepers..... 291
Iron telegraph poles..... 376
Iron trade, the..... 33
Iron tubes..... 165
Ivory plant..... 242

J

Japanning on metal, wood, and paper..... 132
Jarrah timber..... 245
Jersey City stand pipe..... 68
Jeweler's cement..... 116
Joint for metal roofing..... 331
Journal of mill spindle..... 170
Jupiter, something wrong with... 322
Jute..... 178, 390

K

Kalsomining..... 351
Kansas, the plains of..... 69
Kaolin..... 185
Kerosene frauds..... 128
Kerosene murder..... 119
Keying wheels to shafts..... 202
Key ring and door fastener combined..... 139
Kiln for treatment of wood..... 409
Kitchen boilers..... 143
Knitting machine..... 27
Knives, manufacture of spring.... 401
Knots and splices..... 176
Knowledge of common things, a 263

L

Labor enslaved to capital..... 359
Lace, why costly..... 70
Lacker, colorless..... 9
Ladder stand..... 395
Lafitte, Jean, and his treasure.... 360
Lamp chimney..... 171
Lamp chimneys, breaking..... 59
Lamp chimneys for signal, etc.... 299
Lamps, a suggestion regarding... 308
Land of ice and ice, the..... 97
Lapland glue..... 127
Largest gun in the world..... 135
Lavas, something about..... 37
Law in rejected cases..... 52
Leaching apparatus..... 139
Lead ore in Ohio..... 101
Leaky faucets..... 314
Leather punching and feeding machine..... 139
Leeches..... 197
Lefthandedness..... 310
Leggett, General M. D..... 74, 215
Legislation on medical prescriptions..... 136
Legislation, steam boiler..... 117
Legislative teller and recorder.... 219
Lenox library, the..... 249
Let in the sunlight..... 393
Liberal education, a..... 227
Library of trees..... 281
Licencing drug clerks..... 307
Liebig, a card from Professor.... 361
Life preserver for hotels..... *35
Life preserving trunk..... 314
Life without phosphorus, no..... 340
Lifting cure, the..... 152
Lifting jack..... 59, 170
Lightning conductors..... 329
Lime kiln..... 187
Limit of invention, the..... 23
Link motion, the..... 394
Linseed oil, Vincent's process of 337
Liquid glue..... 394, 408
Liquid inhaler..... 234
Liquid meter..... 234
Liquorice..... 51
Lithofracteur..... 403
Lithofractor for destroying cannon..... 328
Lithographic printing machine... 15
Locomotive water troughs..... 229
London, the water supply of..... 328
Long Island oil and fisheries..... 21
Long *versus* short lamp wicks.... 324
Loom..... 251
Louisiana State fair..... 185
Lubricating device for loose pulleys..... 331
Lubricating oils..... 137
Lubricator..... 10
Lubricator for steam cylinder.... 219
Lumber trade, the..... 79
Luminosity of cloth when torn... 116
Luna moth..... *210
Lunar phenomenon..... 164
Lunar rainbows..... 209
Lunar rainbows and haloes..... 244
Lunch box..... 347
Lyceum of natural history.... 169, 184

M

Machine for coiling bed springs.. 219
Machine for cutting and bending sheet metal..... 331
Machine for cutting corn stalks... 123
Machine for cutting printer's rules 171
Machine for cutting tobacco..... 136
Machine for degerminating malt.. 123
Machine for making skewers..... 315
Machine for manufacturing composition roofing..... 267
Machine for printing oilcloth, etc. 267
Machine for pulping wood..... 59
Machine for tapping boilers..... 202
Machine oyster shucker..... 379
Maggots in the ear..... 313
Magic lantern..... 378
Magnetic engines, their possible duty..... 261
Mainsprings, why they break,... 36, 52
Making U magnets..... 26
Malt without germination..... 211
Mandrel for lathes..... 202
Manganese in vegetables..... 249
Man not made of clay..... 52
Manufacture of alum..... 240
Manufacture of chlorine..... 298
Manufacture of French nails..... 245
Manufacture of glue..... 198
Manufacture of haircloth..... 225
Manufacture of needles..... 337
Manufacture of picture nail heads 219
Manufacture of pig iron in Europe 309
Manufacture of silk..... 344
Manufacture of varnish in England..... 384
Manufacture of white lead..... 234
Manufacture of wire..... 297
Marine glue..... 85
Marine storm signal light..... 323
Maritime exhibition, Italian..... 358
Match safe..... 251
Material for ice houses..... 210
Matting machine..... 75
Measurer, liquid..... 219
Measuring angles, instrument for 136
Meat safe..... 379
Mechanical engineer, profession of 23
Mechanical equation, the..... 151
Mechanical power..... 26, 39
Mechanical tests..... 325
Mechanics and physics, instruction in..... 215
Medical compounds, 10, 27, 107, 139, 347
Medicine of a patent, the..... 264
Medicines of the ancients..... 182
Mending broken castings..... 362
Men of progress..... 52, 84, 133
Mental emaciation..... 375
Metal founders' blacking..... 372
Meteorology in Iowa..... 134
Meteors, composition of..... 297
Method of constructing wells.... 202
Method of tinning copper, etc.... 214
Metric system, the..... 336
Microscope in the study of rocks, use of..... 200
Microscope, the..... 329
Microscopical writing..... 149
Microscopic photography..... 166
Middlings purifier..... 26
Milk coolers..... 401
Mill brush..... 59
Mill hands in Fall River..... 51
Millstone..... 379
Millstone balance..... 91, 251
Millstone dress..... 394
Millstone dressing machine..... 314
Millstone driver..... 91
Millstone levelling..... 20
Millstone, speed of..... 9
Mineral oils, treatment of..... 165
Mineral resources of Missouri.... 185
Minerals, rare..... 105
Mining ditches in California..... 163
Mining schools in the United States..... 280
Missouri, cave in..... 353
Missouri river, improvement of.. 405
Mixed felted goods..... 251
Mixing metals..... 186
Mixture for gilding, and how to use it..... 288
Moabite stone, the..... 352
Mode of closing water courses in oil wells..... 202
Modified forms of screws..... 57
Molding figures in paste, wax, and clay..... 58
Molds for medals..... 266
Moltke, Count, aged 70..... 33
Mont Cenis tunnel completed.... 23
Mop..... 283
Moral lubricator, the..... 216
More about rating boilers..... 231
More humorous than scientific... 296
Morse, address of Professor..... 405
Morse statue, inauguration of the. 407
Mortar light..... *275
Mortising blind styles..... 363
Mortising chisels..... 234
Mosquitoes in New Jersey..... 308
Moths, destroyer for..... 40
Motive power, electricity as a.... 358
Motive power, expansion of gases, etc..... 133
Motive power for western farmers 132, 340
Motive power, new..... 43, 49, 52
Mountain sickness..... 240
Mower and reaper..... 170
Mowing and reaping machine..... 75
Mowing machines, improvement in..... 133
Mucilage for parchment paper..... 405
Mule, value of the self acting..... 291
Museum of Art and Natural History..... 184
Mussel climbing..... *291

N

Nail cutting machine..... 409
Nail head..... 43
Nail machine..... 170, 219
Nail plate roller..... 234
Names of our children..... 262
Naphthaline and its uses..... 72
Narrow and wide gages..... 71
Narrow gage railways..... 151
National Photographic Association..... 182
Natural history, study of..... 25
Nature of different gums..... 193
Nature of the earth's interior.... 329
Navigation problem, canal..... 359
Necessities of life, the..... 343
Need for long lamp wicks..... 293
Needles, American..... 99
Needles, the manufacture of..336, 337
New expeditions to the Arctic regions..... 403
New musical instrument..... 281
New plastic material..... 169
News, how sent to Paris..... 149
Newspaper addressing machine.. 315
Newspaper, the first daily in England..... 258
New telegraphic instrument..... 287
New wonder, a..... 274
New York and Brooklyn suspension bridge..... 297
New York city, the government of 406
New Yorker in the salt mines of Cracow..... 320
New York fire department..... 213
New Zealand flax..... 309
Nitro-glycerin..... 9
Nitro-glycerin again..... 216
Nitro-glycerin at Hoosac tunnel, discharge of..... 296
Nitro-glycerin explosions..... 36
Noisy gears..... 394, 408
Non-conducting composition..... 27
North Polar expedition, German.. 18
Note on caseine and milk ash 361

O

Oakes-Ames, failure of..... 40
Oak graining..... 129
Oak graining in oil colors..... 176
OBITUARY:
Albro, James..... 102
Becquerel, Antoine C..... 264
Bonard, Louis..... 345
Brassey, Th mas..... 168
Brown, Harvey..... 9
Burden, Henry..... 73
DeMorgan, Augustus..... 262
Forbush, Walter B..... 217
Haight, A. R..... 200
Herschel, Sir J. F. W..... 345
Lyman, Hon. David..... 89
Muspratt, Dr. Sheridan..... 161
Pirsson, J. P..... 217
Staedeler, Professor..... 392
Steinway, Henry..... 117
Von Haidinger W..... 281
Wetherill, Chas. M..... 217
Objections to practical use of oxygen in illumination..... 166
Object teaching and science..... 39
Oceanic, new steamship..... 233
Ocean telegraphy..... 360
Odometer..... 170
Oil cloth window shades..... 9
Oiler for journals of pulleys..... 154
Oiling furniture..... 378
Oils, lubricating..... 137
Oil tank discharger..... 75
Old molder, the..... *335
One hundred thousand dollars reward..... 288, 295
Opium culture..... 192
Opium medicine, a new..... 137
Optical appearance of cut lines in glass..... 397
Organic matter in water..... 119
Origin of locomotives..... 150
Ornamenting paper..... 136
Oxygen gas from bleaching powder..... 150, 226
Oxyhydrogen cupola..... 234
Oxyhydrogen gas light in Buffalo 57
Ozokerit, manufacture of..... 325

P

Package for oysters, clams, etc... 299
Padlock..... 250
Paine's electromagnetic motor... 212
Paint brush..... 43, 75
Painting on iron work..... 361
Painting on leather..... 229
Painting whitewashed walls..... 123
Paint pot holder..... *84
Palm leaf hats..... 353
Palm wool, or zamia..... 338
Paper bed bottom..... 75
Paper hanging..... 233
Paper pulp from wood, straw, etc. 232
Paper wheels..... 137
Papier maché and carton pierre.. 373
Passivity of iron, and electrolysis 310
Paste that will keep..... 170, 218
Past, the Present and the.... 73, 88, 104, *114, 137, 168, 229, 265
Patent cultivators..... 134
Patent law, defect in..... 99
Patent laws, the..... 241
Patent office, recent decisions at.. 137, 201, 377
Patent office reports..... 9
Patents on small articles, value of 130
Patents or no patents..... 100
Patents, recent American and foreign..10, 26, 42, 59, 75, 91, 107, 123, 139, 154, 170, 187, 202, 219, 234, 250, 266, 282, 299, 314, 330, 347, 362, 379, 395, 409
Pavements..... 23
Pawnbroking during the siege of Paris..... 240
Peanuts and peanut oil..... 149
Peat fuel..... 228
Peat fuel for locomotives..... 152
Pecuniary prospects of East River bridge..... 136
Pencil marks on paper, to fix..... 394
Pendulum level and clinometer.. 315
Pennsylvania iron ore beds..... 261
Percussion fuse, Prussian..... 97
Perfuming and disinfecting apparatus..... 267
Permanent ink for type..... 346
Perpendicular by plumb line..... *35
Perpetual motion...*2, *19, *34, *50, *67, *82, *98, *114, *131, *146
Perpetual motion, Wickham's..... 4
Personal..... 56
Peter Cooper's, Mr., gift to the mechanics of New York..... 168
Petroleum as an illuminator..... 148
Petroleum barrels, danger of using 56
Petroleum dangers..... 212
Pew shelf..... 10
Phenomena of vibration, the..... 400
Philanthropic temperance man, a. 168
Phosphate of lime as a mordant.. 89
Photographic galleries in New York..... 72
Photographs, reducing faded..... 34
Piano violin..... 347
Picket cutter..... 267
Picture nails..... 59
Piers for New York, new system of 375
Pile for nut blanks, etc..... 299, 299
Pills, manufacture of..... 43
Pins..... 341
Pin stand on its point? will a..... 345
Pipes for domestic water service. 311
Pipe wrench..... 409
Pisciculture in New York and New Jersey..... 247
Piston, A. H. Smith's..... 59
Piston, new..... *99
Piston packing..... 283, 315
Pittsburgh, the growth of..... 226
Place of the mitrailleur in war ... 63
Planet Mercury, the..... 297
Planet Venus, the..... 226
Planing machine..... 234
Planing tool..... 283
Planter and cultivator..... 11
Plastered walls and ceilings..... 54
Plastering..... 210
Plaster sower..... 202
Plastic compound for saddletree. 234
Platen feed guide..... 219
Platform spring couplings..... 251
Plating and gilding without a battery..... 320
Plating on iron or steel..... 314
Plow..... 26, 75, 154, 363
Plow culter..... 10
Plowing and cultivating by steam 374, 376
Plow, reversible..... 43
Plumbago oil cans..... 282
Plummet, deviation of..... 20
Pneumatic tubes..... 259
Pocket chronometers..... 228
Poetry and patents..... 128
Poison in bread..... 337
Poisoning with nitro-benzole..... 296
Poison of the cobra..... 355
Poisonous fertilizers..... 292
Poisonous fishes..... 266
Poker pictures..... 17
Polishing collars and shirts..... 114
Pond, a subterranean..... 209
Popular errors regarding the watch..... 35, 147, 260, 308
Popularizing science..... 360
Population of European nations.. 185
Population of the globe..... 96
Porcelain process with collodion 262
Portable fare box..... 27
Post hole digger..... 139
Potato digger..... 27, 208, 299, 340, 347
Potato diggers a failure..... 260, 404
Potatoes as a remedy for incrustation in boilers..... 122
Potato masher..... 202
Pot on the fire, the..... 322
Pounding of piston..... 378, 394
Pound net..... 283
Powder flask..... 202
Power for less than nothing..... 281
Power for small machinery..... 409
Power of a stream, to estimate the *35
Practical problem, a..... *147
Precautions in using wire rope... 304
Preparing and mashing grain, Fring's process..... 310
Preparing linseed oil, Vincent's process..... 337
Preparing silk, etc., for weaving. 250
Preservation of honey..... 99, 305
Preservation of iron from oxidation..... 85
Preservation of meat..... 293
Preservation of phosphorus..... 127
Preservation of wood under water 217
Preserve fats, how to..... 355
Preserving dead bodies..... 25
Preserving flowers..... 379
Preserving meat in cans..... 150
Preserving meats, fruits, etc..... 107
Preserving stone from effects of damp air..... 400
Preserving wood, Thomas's process for..... 368
Press..... 27, 154
Preventing rust..... 296
Prevention of fermentation..... 225
Prevention of incrustation in boilers..... 235
Prevention of rust..... 288
Printer's furniture..... 395
Printing press attachment..... 123
Production of the precious metals 161
Product of coal..... 149
Profits on patent sewing machines..... 373
Progress of chemical science..... 7
Progress of Darien ship canal..... 215
Progress of foreign invention.... 57, 136, 165
Progress of ignorance..... 242
Propeling apparatus for street car 26
Propeller..... 59, 363
Proplasm again..... 401
Proportion of sliding surfaces.... 356
Proposed centennial exhibition in Philadelphia in 1876..... 391
Proposed changes in the British patent laws..... 279
Protecting roofs from fire..... 329
Pruning shears..... *99, 363, 401
Pruss an field artillery, the..... 321
Prussian staff organization..... 265
Publications, new..42, 60, 75, 91, 105, 138, 155, 169, 185, 201, 233, 252, 282, 298, 314, 346, 394, 409
Puddling furnaces..... 165
Pulverized soap..... 235
Pump..... 91
Purification of sirup, Seyferth's process..... 85
Purifying gas and soap limes..... 95
Putting up ice cream, etc..... 299
Pyroxilin in oils..... 33

Q

Queries, 9, 25, 41, 74, 91, 106, 122, 138, 154, 161, 187, 201, 217, 233, 249, 266, 299, 315, 331, 347, 363, 378, 394, 409
Question in physics, a..... 197
Question in social science..... 327

R

Railroad car coupling..... 283
Railroad cars, history of..... 133
Railroad car running gear..... 363
Railroad car spring..... 43
Railroad car starter..... 395
Railroading, early..... 292
Railroading in the olden times.... 242
Railroad litigation..... 72
Railroad monopolies..... 55
Railroad pier in California..... 117
Railroads in Iowa..... 274
Railroads in the Southern States. 40
Railroad switch..... 331
Rails, standard sizes for..... 293
Railway bridge over the Ganges. 304
Railway rail joint..... 409
Railway signal apparatus..... 283
Railways, suggestions for the improvement of..... 199
Railway transit in New York..... 199
Rain statistics..... 136
Rain water cistern..... 52
Raisins in California..... 245
Rambles for relics..... 104, 180
Ramie..... 224
Rancid butter, to restore..... 330
Range of guns..... 9
Ransome's artificial stone..... 352
Rather late in the day..... 346
Rating of boilers..... 199
Rattan factories in Massachusetts. 64
Rattling window sashes, remedy for..... 54
Reciprocating parts of steam engines, action of, *83, *147, *179, 197, 229
Recoloring fabrics..... 315
Recovering gold..... 399
Reduction of silver ore..... 281
Reed for organs and melodeons.. 187
Refined oil, preparation of..... 210
Refuse and waste..... 313
Regulator..... 363
Rein holder..... 202
Remarkable geological discovery. 1 6
Repairing roads..... 391
Repeating firearms..... 202
Report of judges, American Institute..... 184
Resistance of telegraphic relays. 138
Resources of the Northwest..... 402
Revaccination—glycerin lymph.. 406
Revenue of the Patent Office..... 213
Reversible broiler..... 139
Revolving battery gun..... 170
Revolving cannon..... 10
Revolving churn..... 154
Revolving inkstand..... 395
Rhesa fiber..... 130
Rheumatic liniment..... 10
Rice paper plant..... 146
Riding plow..... 349
River Amazon, facts about the... 128
Rock drill..... 234, 331
Rolling metal..... 363
Romance of science..... 101
Roofs and roofing..... 279
Rope coffee and spring saw beans. 18
Rotary steam engine..... 251
Rubber tires for traction engines. 183
Rumford's scientific discoveries.. 321
Running gear of wagons..... 75
Russian foods..... 335

S

Saddle bag..... 234
Safety can..... 331
Safety railway axle..... 197
Salt cellar..... 107
Salt in San Domingo..... 278
Salt, uses of..... 134
Salt well in Nebraska..... 86
Salt wells in Prussia..... 264
Saw arbor..... 395
Saw dust in smith's shop..... 53
Sawing machine....43, 170, 219, 251, 363
Saw mill..... 363
Saw set..... 43
Saws, manufacture of, in Sheffield. 16
Scaffold..... 123
Science, imagination in..... 246
SCIENTIFIC AMERICAN clubs..... 9
SCIENTIFIC AMERICAN goes everywhere..... 73
Scientific and technical awakening, a..... 183
Scientific education and religion. 216
Scientific intelligence, 105, 137, 161, 185, 217, 249, 264, 280, 296, 314, 328, 392, 405
Scientific value of the Central Park..... 88
Scratches on horses, to cure..... 264
Screw cutting dies..... 43
Screw jack..... 363
Scrolls for spinning mules..... 395
Sea baths in cities..... 323
Seahorse, the..... 298, *306
Seal fishing..... 336
Seaweeds, enormous..... 38
Secrets of nature, the..... 310
Sectional ceilings and walls..... 282
Seed drill..... 308
Seed drill, etc..... 75
Seeding machine..... 43
Self-acting shackle and car brake..... 187
Self-acting ships' pumps..... 267
Self-closing cock..... 123
Self-filling bobbin winder..... 363
Self-loading dumping cart..... 170
Setting for stones and jewels..... 107
Setting long cylinder boilers..... *255
Sewage purification..... 17
Sewer basin trap..... 75
Sewing and cooking..... 85
Sewing machine..... 10, 18
Sewing machine for boots and shoes..... 363
Sewing machine in England, Singer's..... 406
Sewing machine motor..... 107, 379
Sewing machine seat..... 139
Sewing machine, the Davis..... 217
Sewing machine treadle..... 170
Sexes of the lobster..... 373
Shape of saw teeth..... 273
Sharpening horseshoe calks..... 379
Shawl strap..... 267
Sheathing of iron ships..... 259
Sheeps' pelts with the wool on... 90
Sheet metal fruit cans..... 234
Sherman process, the..... 183
Shingle machinery..... 331
Ships' windlass..... 27
Shirt polishing machine..... 202
Shot case and distributor..... *22, 43
Shovel..... 234
Show cases..... 267
Shower of insects..... 227
Shutter worker..... 409
Sickness a nuisance..... 226
Siding gage..... 71
Sights for firearms..... 171
Signal service in the U. S..... 56
Silk culture..... 181
Silver, characteristics of..... 144
Silvered arcs..... 235
Silvered circles..... 235
Silvering glass..... 280
Silver ores from Utah..... 393
Silver plating, solution for..... 305
Silver soap..... 372
Silver solder..... 201, 218
Simplicity in design..... 292
Sewing machine in England, Singer's..... 406
Single rail tramway..... 353
Sinking screw piles..... 75
Sirups..... 132
Sisal grass machine..... 10
Six months' progress in engineering..... 7
Skates..... 234, 267
Skates, something about..... 95
Slag, improved mode of removing 139
Sleeping cars..... 267
Sleeve and chemise button..... 267
Slide valves..... 394
Small pox, the marks from..... 406
Snail, the..... 306
Snakes..... 241
Social science..... 40
Society of Engineers and Associates..... 89
Sofa bed..... 267
Solar eclipse of Dec. 22, 1870..... 52
Solar motive force..... 218
Soldering castings..... 26
Soldering spring wire..... 401
Soluble glass..... 87
Solution of silk in photography, use of..... 161
Something about seeds..... 273
Some things I don't want in the building trades..... 179
Sound, Professor Tyndall on..... 373
Soup, why wholesome..... 80
Spade..... 107
Spark arrester..... 43, 299
Speaking and singing without a tongue..... 143
Spectroscope, a new..... *363
Spice boxes..... 20
Spindle bearing..... 251
Spindle for wringer roller..... 266
Spinning head..... 379
Spinning mule..... 330
Spinning tin plate..... 218
Spirit level, to test..... 9
Spiritualism and science..... 20, 24, 80
Spittoon lifter..... *282
Spoke tenoning machine..... 107
Sponge, white..... 217
Spongio-pline..... 89
Spontaneous combustion..... 81, 162
Spring bed bottom..... 379
Spring bottoms for wagons..... 59
Springs of iron wire, to make.... 266
Spurious champagne..... 68
Spurious metallic filling for teeth 82
Stalls for horses..... 267
Stamp..... 107
Stamp holder..... 107
Standard public time..... 8
Star Sirius, the..... 294
State reward for inventions..... 249
Statistics of boiler explosions.... 153
Statistics, school..... 133
Steam and hydraulic press..... 170
Steam and water engines..... 170
Steam cultivation..... 329
Steam engine..... 171, 267
Steam generator..... 10, 59
Steam generator and distiller..... 10
Steam hygrometer, Mr. Leicester Allen's..... 312, 356, 357
Steaming apparatus..... 234
Steam mangle..... 363
Steam on the Erie Canal..... 343, 376, 388, 404
Steam plowing..... 69
Steam plows..... 148
Steam plow, the coming..... 306
Steam pump..... 74
Steam radiator..... 331
Steam, temperature of..... 9
Steam towage..... 389
Steel pen, a new..... 145
Steel pens, what becomes of the.. 212
Step and tram box..... 139
Stereoscope..... 58
Stings of insects, poisonous..... 69
Stink bug, how it utilizes turpentine..... 162, 196
Stirrups..... 202
Stock cars, Fox's improvement in 374
Stokers, inspection of..... 54
Stone, a new..... 113
Stone cutting by machinery..... 119
Stovepipe shelf..... 59
Stove polish..... 59
Strains on ships at sea..... 353
Strass, to make..... 186
Stretcher for paintings..... 202
Struggles of science, Loring on.... 5
Stucco and plaster work..... 145
Stuffing box for engine pistons... 107
Subsoil plough..... 26, 234
Substitute for albumen..... 256
Subterranean pond..... 209
Subways in London..... 326
Success in life..... 277
Successor to the late Professor Bolley..... 325
Suez Canal, the..... 263
Sugar from melons..... 65
Sugar in France..... 200
Sulky cultivator..... 59
Sulpho-cyanide of ammonium..... 137
Sulphuric acid from gypsum..... 84
Sulphuric acid in Connecticut..... 339
Sulphur in Louisiana..... 344
Sulphurous acid as a disinfectant 89
Sundry notes on illuminating gas. 193
Sun, size of the..... 169
Sun spot, the great, June, 1843..... 272
Sunstroke..... 401
Superheating steam..... 235
Superstition, the old confidence in..... 116
Supply of water to boilers..... 164
Support for the sashes of carriage doors and windows..... 330
Sutro Tunnel, the..... 152
Sweden, women telegraphers in.. 258
Swivel pin for tethering animals. 250
Sword scabbards..... 171
Syphon..... 9
System of balancing vertical masses..... 218

T

Tables..... 10
Table tops..... 10
Tackle block, detachable..... 107
Talking machines..... 32
Tanite..... 200
Tanning..... 123
Tanning sheepskins with the wool on..... 314
Tape measurer and screw driver.. 107
Target game, the..... 42
Tassels..... 395
Tea cultivation..... 89
Technical uses of carbolic acid... 361
Teeth, the care of the..... 152
Teeth, the office of the..... 333
Telegraph apparatus, capture of.. 38
Telegraph, automatic..... 4
Telegraph communication with the Eastern world..... 217
Telegraph dispatch tube..... 163
Telegraphic instrument, the first. 355
Telegraphic possibilities..... 134
Telegraph sounders, relays, etc... 314
Telegraph wires, sounds produced by..... 282
Telescope, to make a..... 250, 266
Tempering chisels..... 235
Tempering old files..... 249
Tennessee Industrial Exhibition.. 288
Tenoning machine..... 234
Tension guide for sewing machine 393
Terra cotta in Georgia..... 240
Test for impurities in gas..... 185
Test for purity of water..... 180
Test for white lead..... 52
Testimonial, a fine..... 310
Testing for gold, with bromine and iodine..... 65
Testing machine for stone..... 289
Testing plated metal..... 224
Testing water meters..... 266,
Textile fiber, a new..... 199
Thallium, its properties and uses. 89
Thatch made by sewing machines 10
Thermometer..... 10
"Thief" and liquid measure..... 10
Thill coupling..... 123
Things worth knowing..... 357
Thinking and speaking..... 288
Thirty-five tun gun, the..... 323
Thirty inch railroad in Ohio..... 86
Thirty inch railroad in Tennessee 377
Thought? is the brain the origin of 341
Threaded envelopes..... 34
Thread take up..... 27
Thumb supporter..... 27
Ticket holder..... 203
Tides in New York harbor..... 100
Tidy pins..... 409
Tile ditcher..... 283
Tile draining..... 169
Tilghman's process for cutting hard substances..... 273
Tin iron, to..... 346
Tint photographs slightly, to..... 261
Tobacco fair in Virginia..... 342
Tobacco pipe..... 395
Tongue for harvesters..... 299
Tools for cutting metals..... 385
Tornadoes of the Southern States 327
Tornado, singular effects of..... 228
Torpedoes for kitting fish..... 393
Torpedoes, oil well..... 358
Torricellian vacuum..... 9
Toughening and refining gold..... 135
Toy gun and pistol..... 409
Traction engines..... 276, 283, 340, 404
Transmission of power by compressed air..... 167

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Trap, roach and bug 107
Tray holder 91
Treadle motion 202
Trees out of place 345
Tree surgery 101
Triangular suspension bridge *242
Trimming yarn and thread 202
Triumphs of science, Dr. Doremus on the 5
Trouble and reward of inventors in England 239
Truss 187
Truss bridges 123
Tubes, heating surface of 26
Tubing the East river, N. Y 264
Tubular steam boiler 251
Tunnel at Detroit 320
Tunnel at Nesquehoning, Pa 345
Tunnel between Hecla and Etna .. 281
Tunnels, railway and canal, in England 277
Turbines 316
Turnbull's blue 346, 378
Turning curved plunger *314
Turning plunger for cylindrical ring *195
Twenty-fourth of May, the 276
Type metal 186
Type setting machine 87, 324

U

Uncommon food 289
Underdraining 281
Underground explorations 353
Unground grain for food 312
United States Signal Service ... 49, 338
Unloading hay, apparatus for 379
Unpleasant discovery in the Patent Office 185
Unsafe oils again 340
Useful invention on shipboard, an 393
Useful recipes 244
Useful suggestions, some 324
Use of silver in decorative art 159
Uses of dissociation 8
Uses of habit 87

V

Vagaries of the Patent Office 402
Vaccination, origin of 342
Value of scientific knowledge to the clergy 246
Valve gear 59
Vapor generators for engines 107
Vaporizing hydrocarbons 315
Vapor lamps and vapor stoves 56
Varnish, shellac 261
Vegetable parchment, manufacture of 226
Vehicle 10
Ventilation of the Liverpool tunnel 178
Vesuvius during an eruption, a night on 354
Veteran inventor, the opinion of a 69
Vibration of thin glass tubes in cooling 241
Victoria Regia flowering in the open air 178
Vigils, prolonged 401
Vine and weed cutter 27
Vinegar apparatus 10
Vision of the year 1900 309
Vital electricity 288
Vocalises, by Anna Ballard 4
Voice from Texas on temperance 308

W

Wagon axle 395
Wagon brake 251, 315
Wagon jack 75
Walking sticks, how made 178
Walter printing press, the 278
Wanted, inventions 161, 320
Warehouse trucks 251
Warming and ventilating railroad cars 185
Warming country houses 192
Warning to inventors 89
Wash boiler 170, 202
Washing machine 59, 107, 139, 154, 171, 234, 314, 315, 331, 379, 395
Washing machine, improved *163
Waste liquor of paper mills 24
Water and wind wheel 251
Water, a remarkable body of 90
Water cooler 91, 395
Water cut-off 139
Watered stock, the effects of 89
Water elevator and carrier 299
Water filter 10
Watering streets with chemicals 258
Water meter 409
Water meter, a new 249
Water pipe protector, a novel 195
Water power on steam vessels 225
Water pressure engines for mines 224
Waterproof floors 283
Water shed by roofing 324
Water tight clothing 231
Watertight cotton cloth, to make 266
Water we drink, the 80
Water wheel 75, 283, 299, 394
Water wheel, a small 180
Water wheels 267
Waterworks of Philadelphia *243
Wealth in our western veins *353
Weatherboard gage 267
Weather, effect of explosions on .. 4
Weaving, a wonder in 240
Weighing scale 331
Weights for experiments 96
Wells, mouse for enlarging 123
West Indies, American improvements wanted in the 401
What a mechanic ought to know .. 55
What women want 292
Wheelbarrow frame 43
Wheel for vehicles 171
Wheels and axles for railroad cars 123
Whip rack 283
Whisky, new and old 216
Whitewash for outside walls 408
Wild pigeons 342
Williams' College scientific expedition 261
Williston university 377
Windmill 251
Window curtain fixture 218
Window regulator 267
Window sill and fire escape 251
Wine basket 218
Wine press 267
Wire fences 314
Wire of solder 122
Wire railway, the 387
Wire screen 219
Wisdom of the Egyptians 58
Wolfe Rock light house 288
Woman thinks of microscopists what a 116
Woman's view of the Patent Office 96
Wonders of the heavens 245
Wood and ivory carving 144
Wood boring beetles *387
Wood carpeting 200
Wooden railroads *212
Wooden railways 241, 292, 341
Wood splitting machine 107
Woolen rags and shoddy 33
Worcester manufacturers 400
Workmen, inventions made by ... 312
Workmen's houses 294
Worms in cotton plant, to destroy 2
Woven wire mattresses .....
Wreck of the *Saginaw* .....
Wrench, improved pipe *32
Wringer 36
Writing and copying case, portable 178
Writing surfaces, enameled 193
Wyoming coal 297, 372

X

Xylonite 48

Y

Year and the day 81
Youthful telegraph operator 261

Z

Zinc as a roofing material 17
Zinc ores, American 66
Zinc water tanks 361

PATENT CLAIMS.

PATENTS, issued Dec. 20, '70 11
" " " 27, '70 27
" " Jan. 3, '71 43
" " " 10, '71 60
" " " 17, '71 75
" " " 24, '71 91
" " " 31, '71 107
" " Feb. 7, '71 123
" " " 14, '71 139
PATENTS, issued Feb. 21, '71 155
" " " 28, '71 171
" " Mar. 7, '71 187
" " " 14, '71 203
" " " 21, '71 219
" " " 28, '71 235
" " April 4, '71 251
" " " 11, '71 267
" " " 18, '71 283
" " " 25, '71 299
" " May 2, '71 315
" " " 9, '71 331
" " " 16, '71 347
" " " 23, '71 363
" " " 30, '71 379
" " June 6, '71 395
" " " 13, '71 412

REISSUES, list of, 12, 28, 44, 60, 76, 92, 108, 124, 140, 156, 172, 188, 204, 220, 236, 252, 268, 284, 300, 316, 332, 348, 364, 380, 396, 412.

DESIGNS, list of, 12, 28, 44, 60, 76, 92, 108, 124, 140, 156, 172, 183, 204, 220, 236, 252, 268, 284, 300, 316, 332, 348, 364, 380, 396, 412.

TRADE MARKS, list of, 12, 28, 44, 60 76, 92, 108, 124, 140, 156, 172, 188, 204, 220, 236, 252, 268, 284, 300, 316, 332, 348, 364, 380, 396, 412.

EXTENSIONS, list of, 12, 28, 44, 60, 76, 108, 124, 140, 156, 188, 204, 220, 236, 252, 284, 300, 316, 348, 364, 396, 412.

DISCLAIMERS, list of, 140, 188, 300, 316, 348, 412.

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116,001.—LIGATURE, ETC.—S. P. Gilbert, Racine, Wis.

REISSUES.

4,419.—TAPE MEASURE.—L. P. Bradley, New Haven, Conn. Patent No. 92,573, dated July 13, 1869.
4,420.—HARVESTER.—J. Butter, Buffalo, N. Y.—Patent No. 26,034, dated Feb. 7, 1860.
4,421.—STOVE.—A. C. Corse, Troy, N. Y.—Patent No. 107,597, dated Sept. 20, 1870.
4,422.—BOOT.—C. S. Dunbrack, Swampscott, Mass.—Patent No. 95,210, dated Sept. 28, 1869.
4,423.—HORSE POWER.—M. B. Erskine. Racine, Wis.—Patent No. 107,237, dated Sept. 13, 1870.
4,424.—DIAPER.—J. C. Hempel, Baltimore, Md.—Patent No. 91,334, dated June 15, 1869.
4,425.—STOCK CAR.—Amos Rank, Salem, Ohio.—Patent No. 111,872, dated Feb. 14, 1871.
4,426.—STOVE.—A. White, Rock Island, Ill.—Patent No. 101,688, dated April 5, 1870.

DESIGNS.

4,984.—CHANDELIER.—P. Cinquini, West Meriden, Conn.
4,985.—BILLIARD MARKER.—H. W. Collender, New York city.
4,986.—CLOCK CASE.—Paschal Converse, New Haven, Conn
4,987 to 4,989.—CARPET PATTERN.—J. Fisher, Enfield, Conn.
4,990 and 4,991.—TYPE.—Julius Herriett, New York city.
4,992.—FORK HANDLE.—W. T. Kennedy, New York city.
4,993.—LONG COMB.—C. E. Moore, New York city.
4,994 to 5,003.—CARPET PATTERN.—E. J. Ney, Dracut, Mass.
5,004.—TOY STEAM ENGINE.—E. P. Ryder, Brooklyn, N. Y.
5,005.—CHANDELIER.—F. R. Seidensticker, West Meriden, Ct.
5,006.—HARNESS.—C. M. Theberath, Newark, N. J.

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323 and 324.—POLISHING COMPOUND.—Enoch Morgan's Sons, New York city.
325.—PERFUME.—Phalon & Son, New York city.
326.—CLOTHES WRINGER.—A. H. Spencer. Providence, R. I.

EXTENSIONS.

SEWING MACHINE.—J. E. A. Gibbs, Steele's Tavern, Va.—Letters Patent No. 17,427, dated June 2, 1857; reissue No. 573, dated July 13, 1858.
INVALID CHAIR.—J. G. Holmes, Charleston, S. C.—Letters Patent No. 17,567 dated June 16, 1857.
STEAM PUMPING APPARATUS.—G. H. Corliss, Providence, R. I.—Letters Patent No. 17,423, dated June 2, 1857.
STEAM PRESSURE GAGE.—C. A. Eastman, Boston, Mass.—Letters Patent No. 17,560, dated June 16, 1857.
HYDRANT.—G. P. Perrine, Richmond, Va., J. E. Boyle, New York city.—Letters Patent No. 17,632, dated June 23, 1857.

DISCLAIMERS.

SAWING MACHINE.—Jacob Lagowitz, Newark, N. J.—Letters Patent No. 10,965, dated May 23, 1854.
SAWING MACHINE.—E. Peck and G. J. Bogert, New York city.—Letters Patent No. 10,965, dated May 23, 1854.
STEAM PUMPING APPARATUS.—G. H. Corliss, Providence, R. I.—Letters Patent No. 17,423, dated June 2, 1857.

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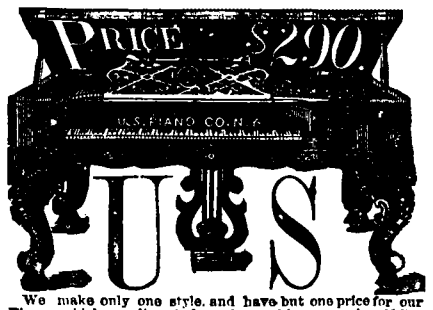

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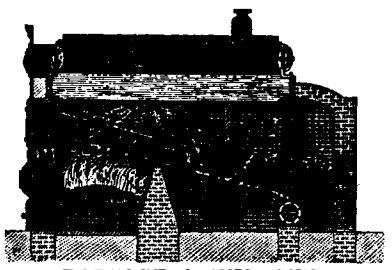

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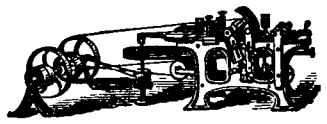

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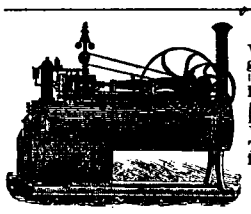

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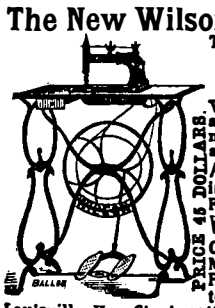

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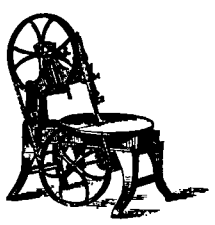

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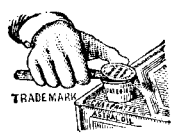

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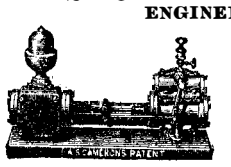

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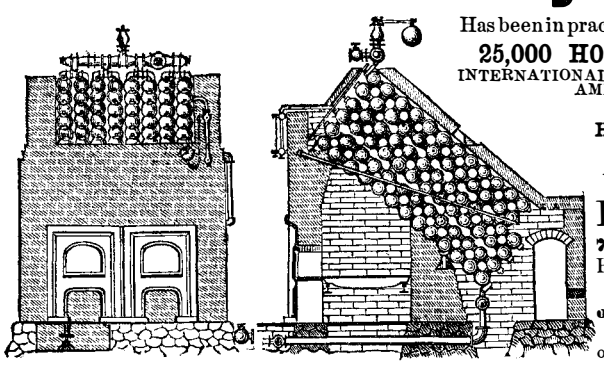

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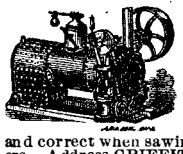

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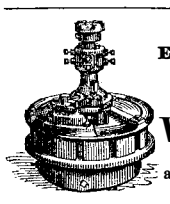

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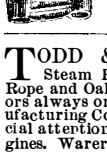

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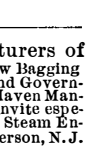

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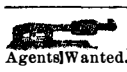

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